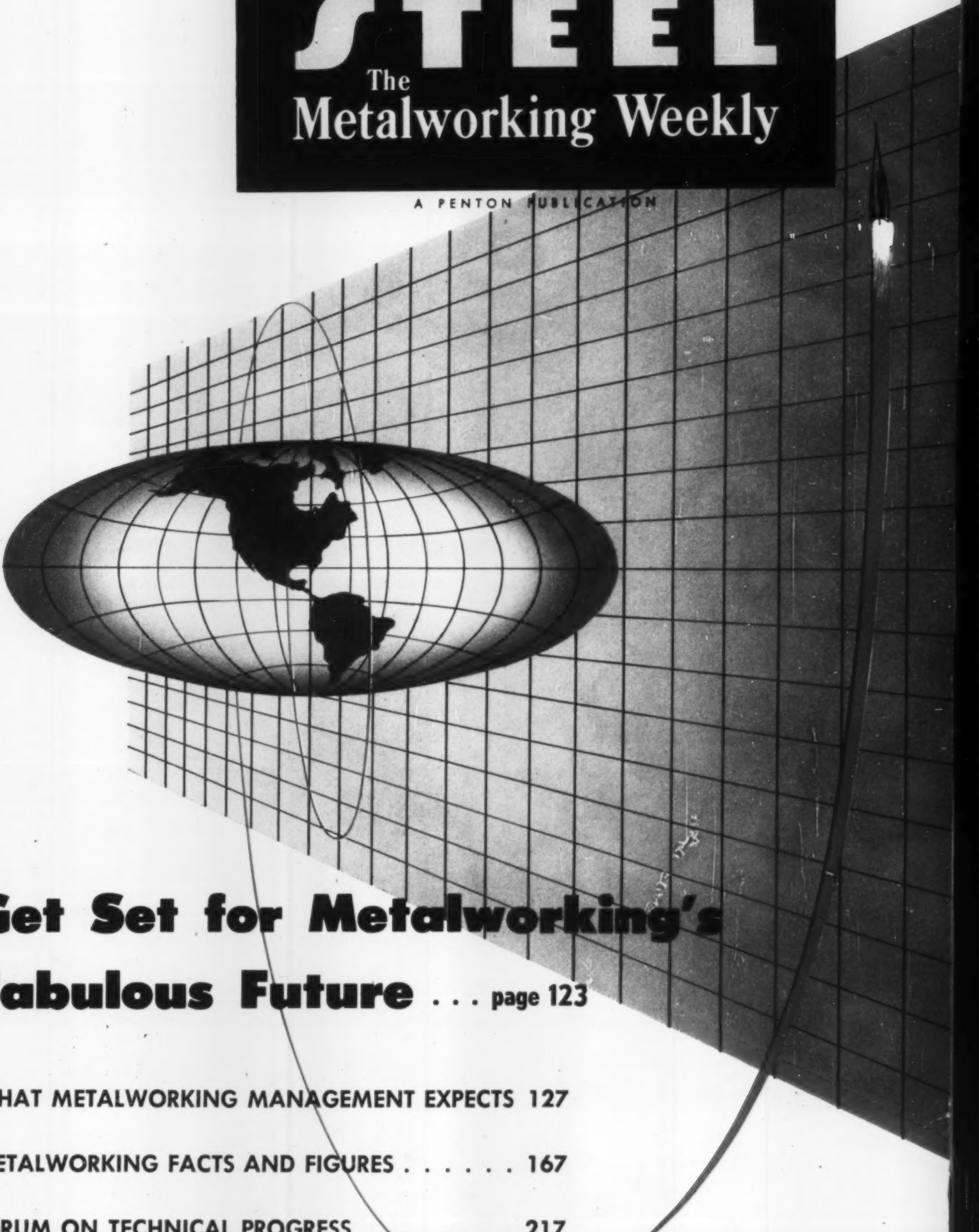
1957 Metalworking Yearbook and Planning Guide

JANUARY 7, 1957

STEEL
The Metalworking Weekly

A PENTON PUBLICATION



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SIMPLIFYING HEAT EXCHANGER AND CONDENSER FABRICATION

The ease with which heat exchanger and condenser tubes can be rolled into tube sheets depends, to a certain extent, upon the uniformity of tube wall. One of the controlling factors of wall uniformity in the manufacture of seamless steel tubing is the contour of the piercer point.

Phil Morrison, a piercer point man, is shown at work on one of B&W's seamless tube mills. One of his duties is to examine the piercer point between each tube making operation. By making certain that the point has not been deformed in service—and that takes experience and a practiced eye—he helps to control wall uniformity in the pierced tube. He knows that although hot and cold work after the piercing operation can minimize, it cannot eliminate non-uniformity of wall section.

Phil's attention to detail, teamed with specially designed piercing equipment, helps to achieve the quality—"ease of rolling-in"—for B&W Heat Exchanger and Condenser Tubes. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pa.

B&W
TUBULAR PRODUCTS DIVISION

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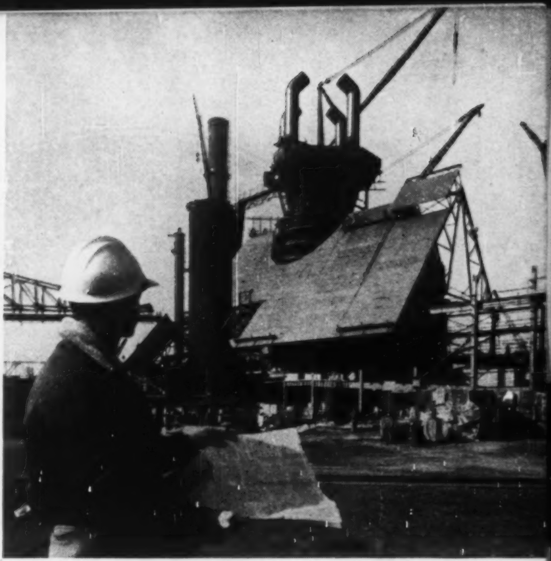
Seamless and welded tubular products, seamless welding fittings and forged steel flanges in carbon, alloy and stainless steels

BETHLEHEM STEEL

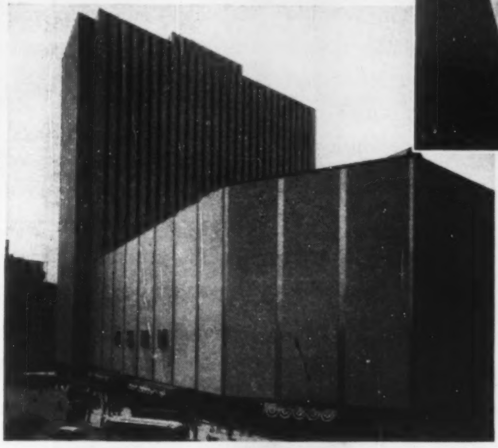
Some Highlights of the Year Just Ended

NEW BLAST FURNACE RISES AT SPARROWS POINT
This new furnace, nearing completion at the year's end, is a key item in the current expansion program at Bethlehem's Sparrows Point, Md., plant, which will give that plant an annual steel ingot capacity of 8,200,000 tons, larger than the present capacity of any other steel plant in the country.

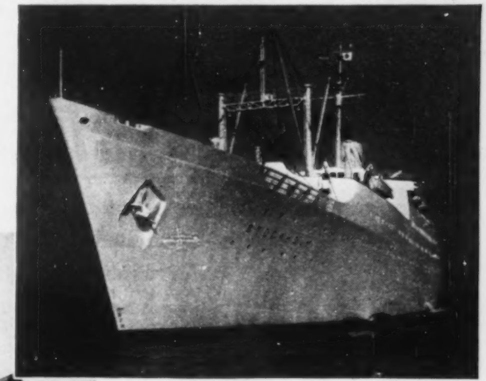


BETHLEHEM STEELS HELP BUILD PENN CENTER
Products from nearby Bethlehem plants are being used in the buildings in Philadelphia's Penn Center, including steelwork from plants at Bethlehem and Pottstown, high-strength bolts from Lebanon, elevator wire ropes from Williamsport, and reinforcing bars from Sparrows Point.

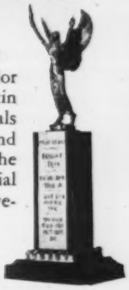
NEW YORK'S NEW SHOW PLACE. Opened in the late spring of 1956, the New York Coliseum has total exhibition area equivalent to nine football fields. Bethlehem furnished the 13,000 tons of steelwork and nearly 4,000 tons of concrete reinforcing bars.



THE "STOCKHOLM" GOES TO SEA AFTER COLLISION REPAIRS
The liner "Stockholm," following repair at Bethlehem's 56th St. Brooklyn Yard of the damage she suffered in her collision with the ill-fated Andrea Doria, passed her sea trials with flying colors and is now back in service.



TIN-MILL FILM WINS "OSCAR"
"Bright Steel," a movie in color telling the story of Bethlehem tin mill products from raw materials to the finished "tin" cans and other familiar uses, received the first place award among industrial films exhibited at the 1956 Cleveland Film Festival.



NEW OPEN HEARTH AT LACKAWANNA
This heat of steel is being poured from a new open-hearth furnace, provided under the program of additional facilities at the Lackawanna, N. Y., plant, a part of the current $300,000,000 expansion program, largest in Bethlehem Steel's history.

MANGANESE ORE FROM BRAZIL AND MEXICO. During 1956 the first shipments of manganese ore were brought out of Mexico and Brazil from properties in which Bethlehem Steel has an interest. Below is shown the new ore-loading station on the Amazon River.

MAKING STEELMAKING SAFER. In the latest annual safety contest sponsored by the Metals Section of the National Safety Council, Bethlehem's Lackawanna, N. Y., plant won first place among all large steel plants. The Bethlehem, Pa., plant won second place, and the Johnstown, Pa., plant third. Among other Bethlehem operations honored for safety achievements were plants at Sparrows Point, Md., and Steelton, Lebanon, and Pottstown, Pa.

BETHLEHEM STEEL

CALIFORNIA SCHOOL FEATURES EXPOSED STEEL
Hillsdale High School at San Mateo, Calif., is typical of numerous new school buildings all across the country featuring exposed structural steel, both indoors and on the exterior. The steel for Hillsdale High was rolled in the Pacific Coast plants of Bethlehem Pacific.

Peter A. FRASSE and Co.Inc.
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for *faster* aluminum service?

No need to keep prospecting for a better aluminum source — once you're acquainted with fast, reliable Frasse warehouse service. Frasse knows the metalworking industry's needs — is geared in facilities and know-how to provide them. Each order, large and small, is processed with time-table precision by Frasse trained personnel . . . and rushed to your plant — fast.

Quality, too — is something you can depend on from Frasse. Time-tested Reynolds Aluminum—processed to exacting tolerances with completely uniform characteristics — can help your production picture and the salability of your product.

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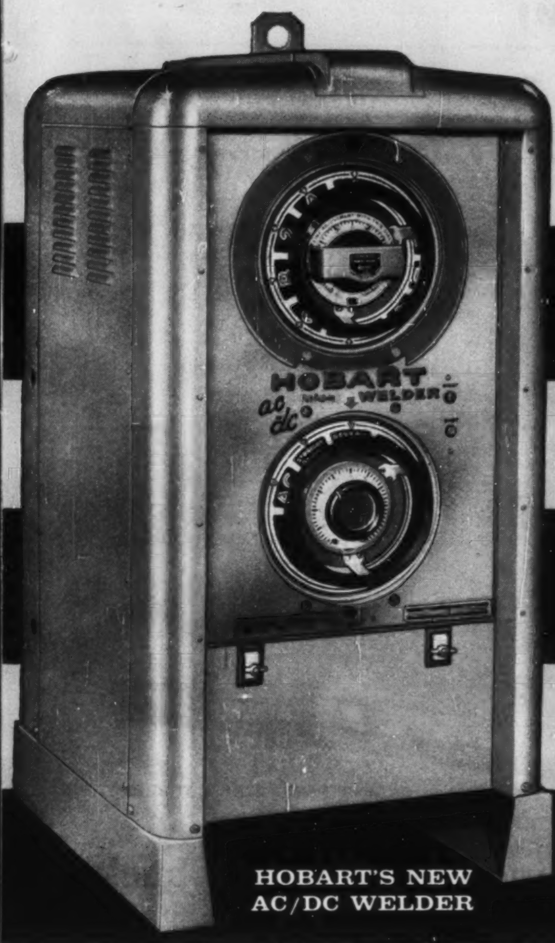
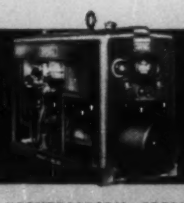
Choose one of these HOBART "cost-cutters" for welding you can count on to produce MORE PROFIT

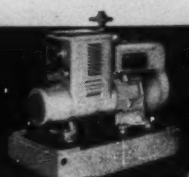


HOBART'S NEW AC/DC WELDER

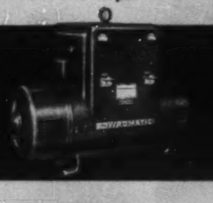


"CONTRACTOR'S SPECIAL" especially designed for all types of in-the-field construction, repair and pipe line work. 250 amps.

GAS ENGINE DRIVE for field use where electric power is not available. 300 to 600 amps.



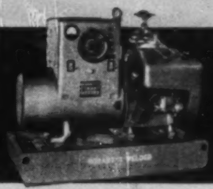
"HUSKY BOY" low cost lightweight aircooled 200 amp. welder for general shop and outside repair work.



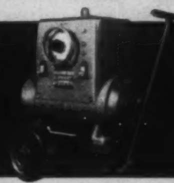
"POWROMATIC" eliminates troublesome electronic controls in automatic welding. 400, 600 and 800 amps.

ELECTRIC DRIVE WELDERS for production, maintenance and general shop work. 200 to 600 amp. sizes.

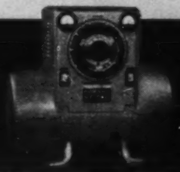
DC RECTIFIER new and improved. Features simplified controls, polarity selector switch, remote control and wide welding range.



AC WELDER—AC POWER COMBINATION gives 200 amps. for welding or 5 KW AC power for operating power equipment.



"BANTAM CHAMP" 250 amp. electric drive for light and medium requirements in general shop use.



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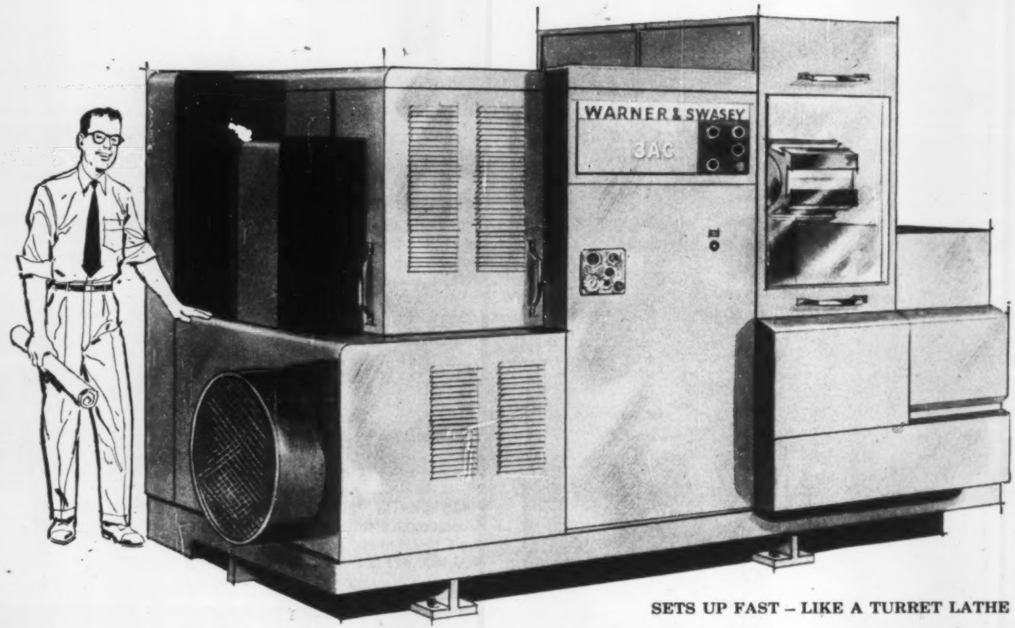

SETS UP FAST – LIKE A TURRET LATHE

Warner & Swasey 3AC Single Spindle Automatic Chucker widens field of profitable turning jobs

This versatile, new model was engineered for fast, automatic machining of your larger, complex chucking jobs. It provides accuracy, metal removal capacity, tooling flexibility and set-up ease and speed heretofore unobtainable by automatic operation in this work range.

For over eight years, enthusiastic users have told us, "Performance records of our Warner & Swasey Single Spindle Chucking Automatics have been phenomenal."

The 1AC model, first introduced at the 1947 Machine Tool Show in Chicago, met with instant field acceptance. In 1953 — 88 customers placed orders for the 2AC model before the first machine was ever built!

Now, Warner & Swasey announces a new, larger capacity, more powerful 3AC model with a 15-inch diameter chuck and a 40-horsepower motor, which will provide fast, automatic production for your larger pieces — precision and otherwise — in all lot sizes.

Our Field Representative will be glad to give you complete details on how this new machine can increase profits on your operations. Why not call him in, today?

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Cleveland
PRECISION
MACHINERY
SINCE 1880

No Matter Which Way You Turn...Warner & Swasey Cuts Costs

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The Metalworking Weekly

January 7, 1957
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Published every Monday by The Penton Publishing Co., Penton Bldg., Cleveland 13, O. Subscriptions in the U.S. and possessions and Canada, $10 a year; all other countries, $20. Current issues, 50 cents each. Metalworking Yearbook issue, $2. Accepted as controlled circulation publication at Cleveland. Copyright, 1957, The Penton Publishing Co.

Index available semi-annually. STEEL is also indexed by Engineering Index, 29 W. 39th St., New York 18, N. Y.

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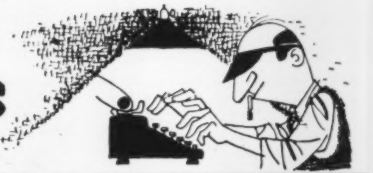
behind the scenes



How It Began

If you're over 80, pick this book up gently, or you'll find your biceps down where your extensor communis digitorum ought to be, and with these solemn words we are off and running with praises for the significant Yearbook and Planning Guide you now hold.

Ain't she a humdinger, boys and girls? Much of the planning began back on Oct. 12 when Editor-in-Chief Irwin Such called a meeting to determine the size of the book and to schedule the forms. Penton Press Manager Carl Schafer began counting the sheets of paper he had available; Art Director Bill Kellogg assembled his artists and estimated how much work he could coax from them; Production Manager Albert Anderson went into a huddle with his assistant, Ethel Bartell, and figured how much space he could give to editors and advertisers; Promotion Manager Sal Marino and Advertising Director Hal Rowland estimated how much space they could sell and Editor Walt Campbell wondered with his staff about how much of what selected material they could prepare in a given time.

As the weeks went by, Al Anderson stayed up nights dividing available space among clamoring advertisers, and sometimes he was heard to murmur that maybe he could rent space on a raft bound for the Solomons.

Profound Data

Mr. Schafer explained that 800,000 sheets of 35 x 46¾-in. paper were required to make this edition of the Yearbook. "The machine coated paper," he said, gazing at the ceiling (wondering, no doubt, if it were about to collapse all over him) "came from the Meade Paper Co., Chillicothe, O., in four tandem-truck loads. When? I don't know exactly; you see, we are obliged to keep a constant supply on hand. Ink? Well, this special edition will consume 1500 lb of black ink, 175 of red, 75 of blue and 50 of green, orange and yellow. I hope you aren't going to ask for an estimate of length of wire used in the stapling, or the weight of the engravings, or the number of typographic characters because I haven't got time to figure answers to silly questions."

We thanked him hastily, knowing that he was under a considerable strain, and rushed off to interview Associate Managing Editor John Morgan, who is equally busy.

"Sir," we began, "what is there about this Yearbook that sets it apart from all that have gone before?"

"Frankly," replied Mr. Morgan, whose nickname (Honest John) was not lightly acquired, "nothing. It is a good, solid, carefully edited, artistically designed and well printed report to the metalworking world. It carries new ideas, current reports on new technical developments, news and predictions from Washington and Detroit, a forecast on metalworking's fabulous future by Walt Campbell, a roundup of information from some 7500 metalworking executives. You see, STEEL brings out a wonderful Yearbook *every* year."

Well Done, All

Nobody who had anything to do with this Yearbook could be induced to praise it more than those of recent years, and we got the feeling that these STEEL staffers reacted like parents: Succeeding Yearbooks were their children, and they couldn't praise one above the other.

It is customary to extend congratulations in all directions when another Yearbook comes off the presses; we should start with the editor, of course, but where should we end? There are salesmen, printers, Linotype operators, bindery operators, pressmen, stenographers, proofreaders, production personnel, every one deserving a compliment. We are happy to be associated with such a wonderful group, happier still to direct attention to their efforts, and glad all over (down, Zero!) to have this opportunity to wish all readers of STEEL a successful and prosperous New Year!

Shrdlu

(Metalworking Outlook—Page 117)

Design of ELPAR Low Headroom trucks permits entry into street trucks and box cars plus high stacking in storage.

Central Control, Sit-down
Low Headroom Series. Capacities: 2,000, 3,000, 4,000 pounds.

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Central Control, Sit-down
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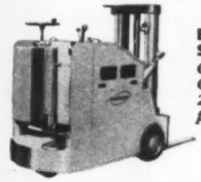
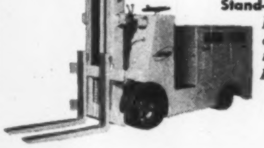


End Control, Stand-up
Cargo Scouts. Capacities: 2,000, 3,000 pounds.



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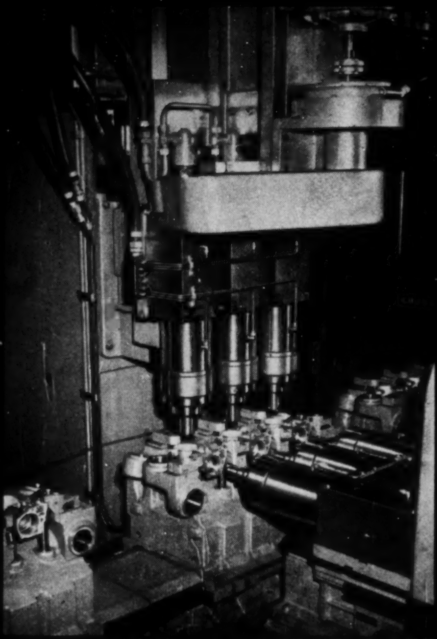
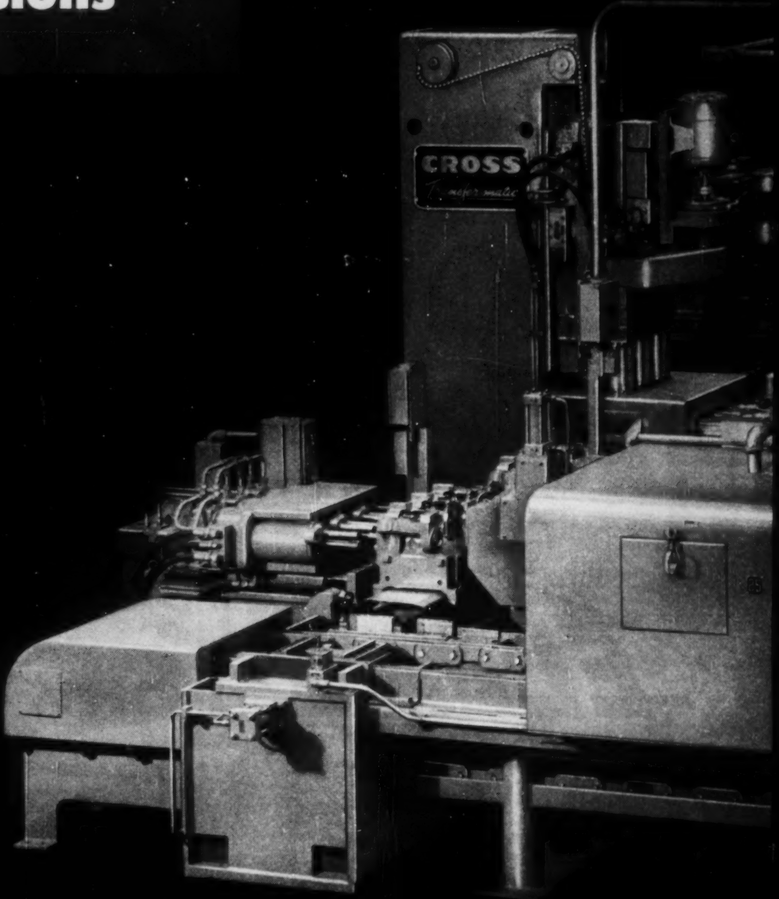
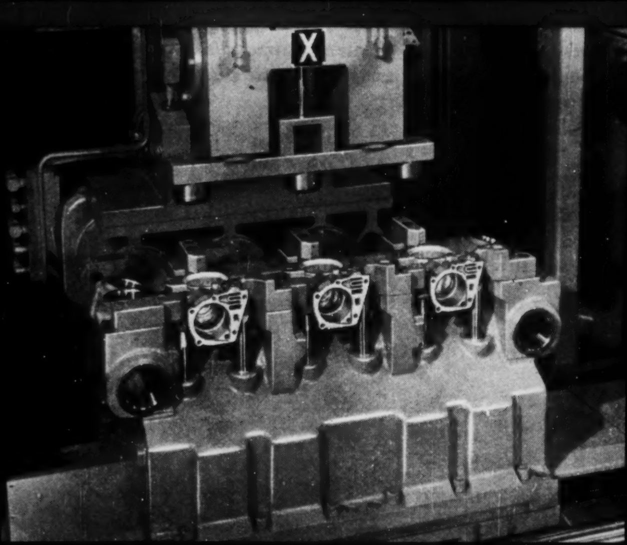
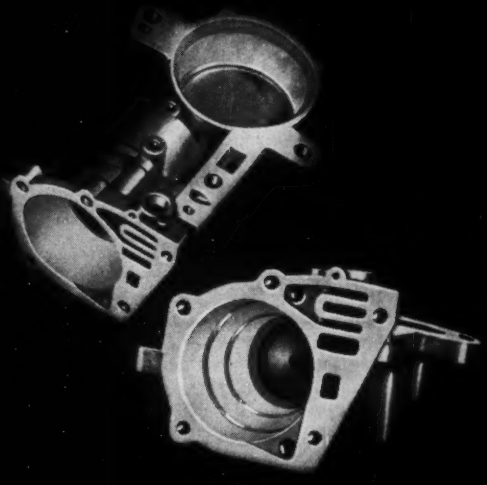


The final precision boring station.

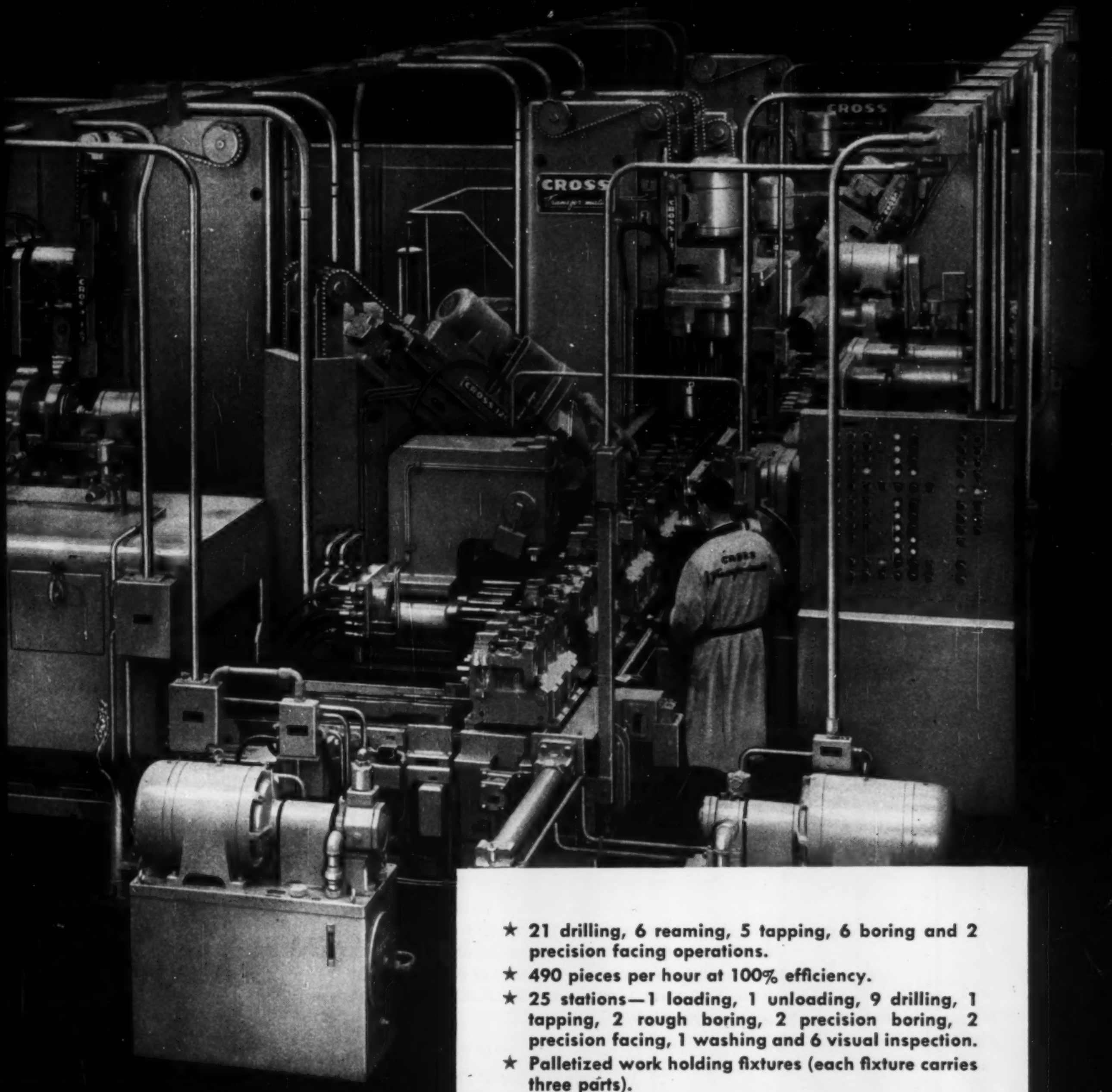

CROSS
Transfer-matic



The loading station. Part locations are checked automatically by Unit X to assure proper clamping.



Another Transfer-matic by Cross



- ★ 21 drilling, 6 reaming, 5 tapping, 6 boring and 2 precision facing operations.
- ★ 490 pieces per hour at 100% efficiency.
- ★ 25 stations—1 loading, 1 unloading, 9 drilling, 1 tapping, 2 rough boring, 2 precision boring, 2 precision facing, 1 washing and 6 visual inspection.
- ★ Palletized work holding fixtures (each fixture carries three parts).
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- ★ Complete interchangeability of all standard and special parts for easy maintenance.
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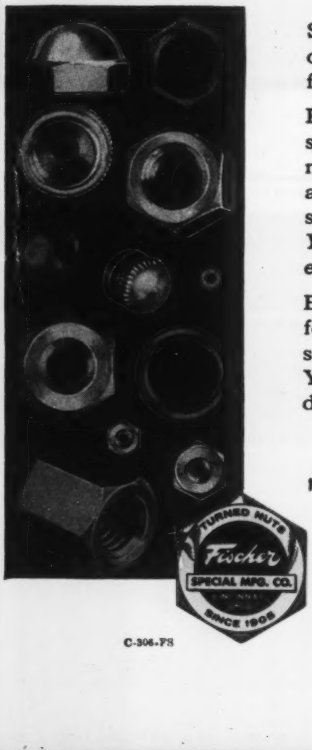

LETTERS
TO THE EDITORS

Active Beaver County Group

One hundred reprints of the Program for Management article, "Industry and College: Partners in Development" (Nov. 12, page 119), were sent to all heads of industry in the Beaver County area, with a letter from G. B. Sheers, our corporation president.

The Manufacturers Association of Beaver County—of which he is also president—is attempting to co-ordinate the efforts of Geneva College with the requirements of Beaver County industries. Your article was referred to in a discussion by this group.

Raymond Cox
General Sales Manager
Standard Horse Nail Corp.
New Brighton, Pa.

Comprehensive Description

For such a short article, the story, "Let Traffic Managers Manage" (Nov. 26, page 68), is a well written and comprehensive description of the advantages of efficient industrial traffic management principles. May I have two reprints?

James W. Lee
Traffic Manager
Kansas City Division
Bendix Aviation Corp.
Kansas City, Mo.

Interested in Airless Plant

We would appreciate several copies of your article, "The Plant That Outlaws Air" (Oct. 22, page 78). We thought it was excellent and were quite interested since we have been doing work on the airtight, air-conditioned outfits.

Charles E. Swope
Sales Manager
Fyrepel Products Inc.
Newark, O.

STEEL: Purchasing Guide

As an avid reader of STEEL, I have found your articles well prepared and timely. Being active in purchasing, I use your market reports as a guide to plan and co-ordinate my purchasing routine.

I am also editor of the monthly publication of the Purchasing Agents Association of Florida, *The Florida Purchaser*. We are always seeking to bring to the attention of our 1500 readers, methods and articles on how to make savings through better purchasing.

Your article, "Write Savings into Specs" (Nov. 26, page 116) is timely

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the factors . . .
$
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PRODUCTS

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Silicon is one of the most widely used of all alloying elements. And it's vitally important that the silicon product you use gives you best results for your specific application . . . at the lowest cost.

The great versatility of silicon requires its selection in the most economical form for each application. Silicon is not only a very active deoxidizer and reducing agent, but also a highly effective alloying element which confers distinctive and desirable properties on a wide range of steels and irons. In carbon and alloy steels, silicon may be used both as a deoxidizer and alloying agent. In cast irons, the element additionally acts as a strong graphitizer. In stainless and heat-resisting steels, silicon may be used also to reduce chrome-bearing slags. Silicon plays a similarly important part in the nonferrous industry . . . in alloying . . . in the production of magnesium and other metals . . . in the manufacture of silicones.

Some silicon products are cheaper than others. But the one that *seems* cheapest may not be the best for your application . . . and can often cost you more in the long run. Our Engineering Sales and Technical Representatives have had long and varied experience in helping to select the right silicon product for thousands of jobs. There's a Vancoram silicon product for every application.

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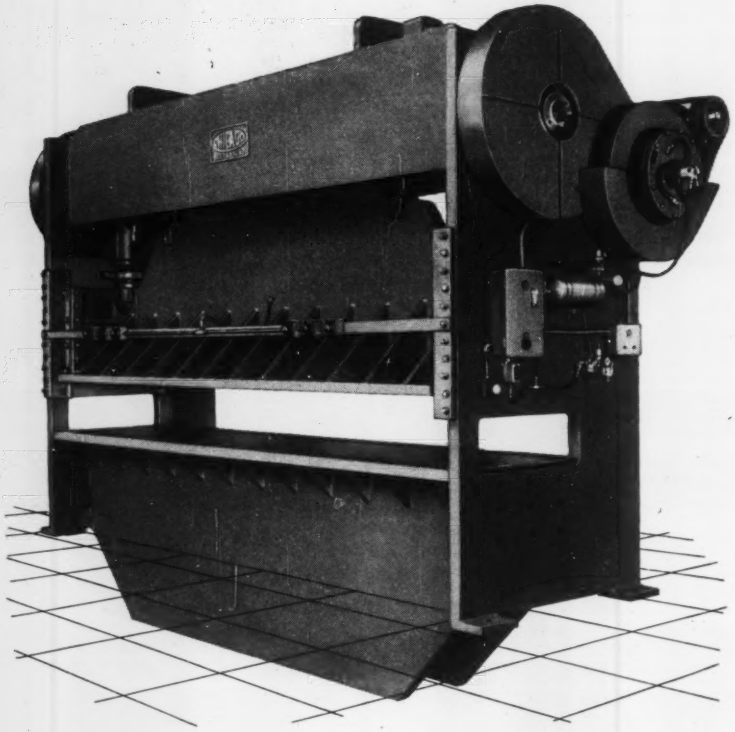
Producers of alloys, metals and chemicals



CHICAGO DREIS & KRUMP

PRESSES
STRAIGHT-SIDE TYPE

large die area
capacities up to 400 tons

This is a typical model of CHICAGO straight-side-type presses used for multiple punching, notching, and trimming operations. This press with a die area of 48 inches by 198 inches has a capacity of 200 tons.

Complete recommendations for any job on request.

6674

CHICAGO DREIS & KRUMP
Press Brakes • Straight-Side-Type Presses • Press Brake Dies
Hand and Power Bending Brakes • Special Metal-Forming Machines

DREIS & KRUMP
MANUFACTURING CO.
7458 South Loomis Boulevard, Chicago 36, Illinois

LETTERS

(Concluded from page 10)

and informative coverage of this subject. We would like permission to reprint it in our magazine.

C. W. Chambers
Food Machinery & Chemical Corp.
Florida Division
Lakeland, Fla.

- *Permission granted.*

Attracted to Magnet

We are interested in a ceramic magnet described in the Technical Outlook column of Oct. 29 (page 121). This magnet is smaller, lighter and has longer effective life than metal magnets. You mention that it's made by North American Philips Co. Inc. We would appreciate the address of this company.

Robert W. Swift Jr.
Swift & Anderson Inc.
Boston

- *It's located at 100 E. 42nd St., New York, N. Y.*

Selector Helps Engineer

We find the Metal Selector (insert in Oct. 1 issue) helpful in our work. Kindly send three copies.

S. T. Evenstad
Evenstad Engineering
El Monte, Calif.

Editorial Draws Query

You mention in your editorial, "Ingredients for Success" (Nov. 19, page 97), Clarence B. Randall's book, *Over My Shoulder*. Where may I obtain this book?

Carl J. Meister
Executive Vice President
Atkins Saw Division
Borg-Warner Corp.
Indianapolis

- *It was published by Little, Brown & Co., 34 Beacon St., Boston, Mass., but should be available in local bookstores.*

Invaluable to Small Business

Please send a reprint of the article, "Know Your Costs" (Mar. 19, page 83). This information will be of invaluable service to my small business.

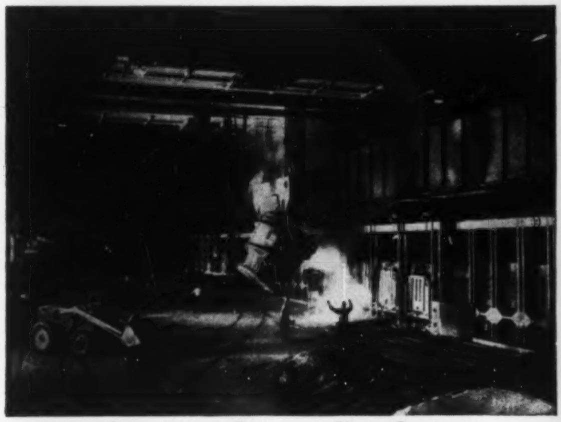
F. M. Campbell
2616 S. Fern St.
South Arlington, Va.

More on Extrusions

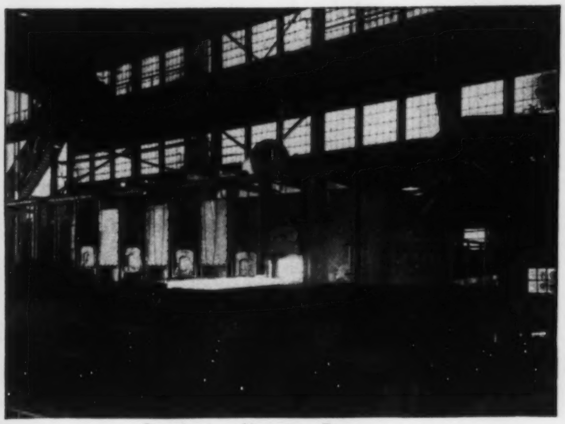
Congratulations on the fine job of covering the magnesium extrusion picture in your article, "More Nonferrous Extrusions" (Dec. 10, page 102). In an otherwise accurate account, we feel there are two items that need correction:

1. Luggage and ladders, while both are exceptionally good markets for magnesium, do not take nearly half of our primary production. The correct figure would be between 2 and 3 per cent. Luggage and ladders do, however, constitute the second largest market for magnesium extrusions.
2. We expect that the Madison (Ill.) mill will eventually turn out 300,000 lb of pellet extrusions annually — maybe more — but it hasn't to date. We erred in reporting to STEEL that the mill produced 300,000 lb of such extrusions during 1956. Actually, the poundage was under 50,000.

William M. Cox
Public Relations Department
Dow Chemical Co.
Midland, Mich.

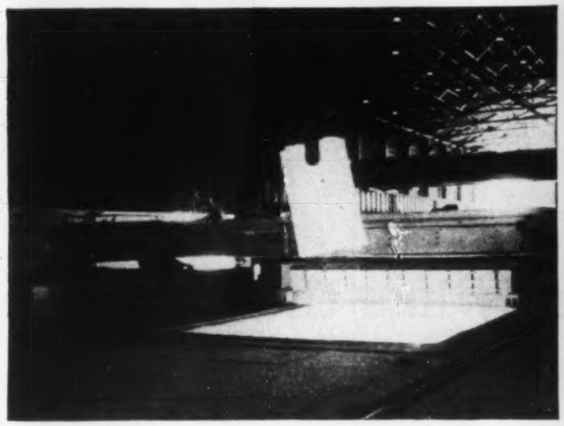


Open Hearth Furnaces—Photo Courtesy
Jones & Laughlin Steel Corp.



Continuous Heating Furnaces—
Photo Courtesy Crucible Steel Co.

Soaking Pit—Photo Courtesy
United States Steel Corp.



Heat Treating Furnace—
Photo Courtesy Taylor Forge & Pipe Works

Increase Production . . . Lower Production Costs with

LOFTUS Industrial FURNACES

For years Loftus Industrial Furnaces have been providing dependable, economical service to the steel industry. Their long life and efficient performance have been proved by time. The fact that they materially contribute to lower-cost operation and increased production is a matter of record.

Whatever your heating or heat-treating requirements, it will pay you to take advantage of Loftus' long experience in furnace design and construction. Many of the world's leading companies have—and to their utmost satisfaction, as proved by the high percentage of repeat orders we get.

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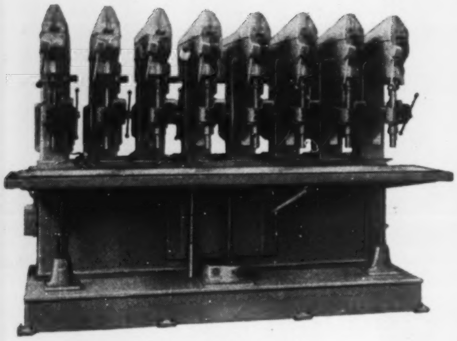
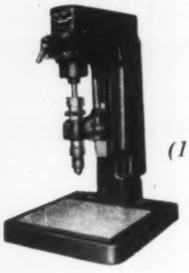
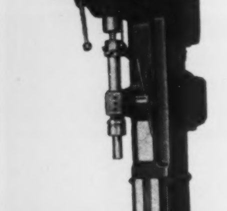
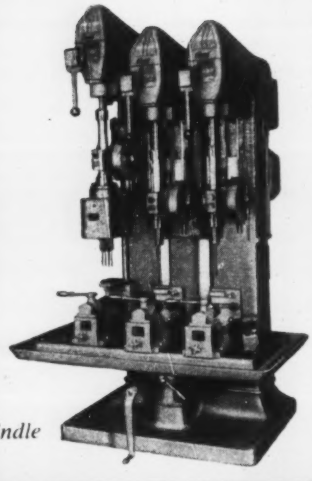
56•23•3

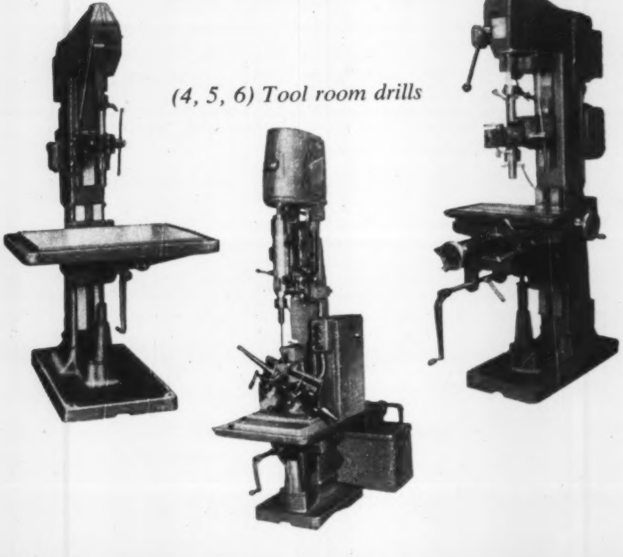
Avey has the right one


(7) Super 8 spindle


(1) Bench type


(2) Column type


(3) Multi-spindle


(4, 5, 6) Tool room drills

Whatever your light and medium duty drilling needs, it's a sure bet that the machine you need is made by Avey. The whole Avey line would pack this magazine with pictures —would give you every combination of size, capacity, speed, overhang, and table arrangement to fit your requirements. The ones shown will give you the general idea. Write for literature.

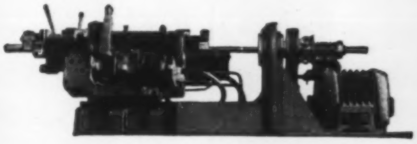
(Figures 1 through 6) Standard Drilling and Tapping Machines. Capacities in cast iron from very small numbered drills to 1½"; 6 or 8 speeds up to 12,000 rpm; No. 32 Jacobs chuck to No. 4 Morse taper; 4 feeds; 1 to 6 spindles; column or bench type; wide range of swing. Featuring such "bonus" advances as micrometer stop collar; telescoping spindle guard; dynamically balanced rotating parts; rack and pinion operated motor plate; large tool and die shop tables; and Avey's pace-setting spindle construction.

(4, 5, and 6) Avey tool room drills, built in No. 2 and No. 3 BMA-6 sizes. Large table 34" x 25"; round table 18" diameter; compound table 25" x 12".

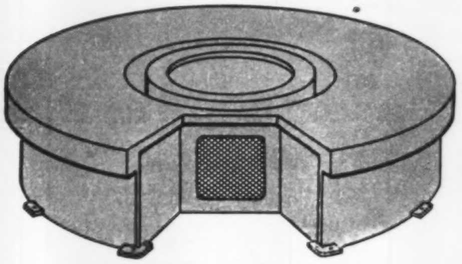
(7) Super 8 Spindle Drilling and Tapping Machine. No. 2 Morse taper. Power lift to table by push button control. Hand feed, power feed, lead screw tapping. Four feeds, 6 speeds. Built-in coolant system.

for Avey makes them all

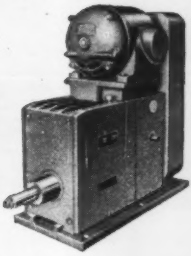
Avey



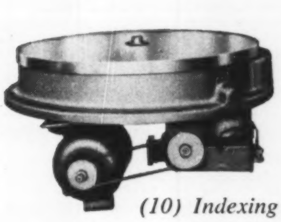
(9) Avey-draulic



(11) Standard base



(8) Cam feed unit



(10) Indexing table

(8) Automatic Cam Feed Units. For drilling, tapping, reaming, hollow milling. Vee belt or gear drive. Nos. 1, 2, and 3 Morse taper. Capacity in cast iron: No. 1, ½"; No. 2, 1". Mount at any angle. Fully or semiautomatic. Self-contained, tamper-proof.

(9) Avey-draulic feed unit. Automatic withdrawal for chip removal only when necessary during deep hole drilling. Rapid advance, feed, and rapid return. Jump feed attachment available. Standard strokes 12" up to 30". Avey's patented Torque-matic control optional.

(10) Automatic index tables. Rapid, accurate indexing to .001". Even or uneven index patterns obtainable. 16" to 48" diameter. All adaptable to Avey standard bases.

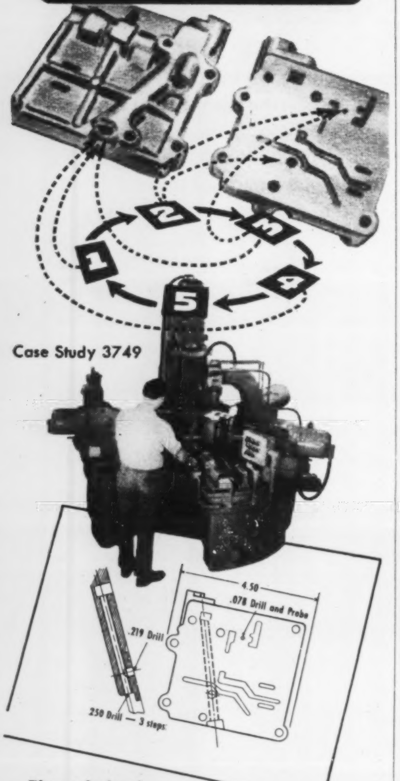
(11) Steel Bases. One of Avey's standard line of fabricated bases. Stress relieved, sandblasted, machined, and painted to fit your application. Combine 8, 9, 10, and 11, and you get fast returns on your investment, and a step ahead of your competition!

THE AVEY DRILLING MACHINE CO., CINCINNATI 1, OHIO

drilling, tapping, production machines

drilled and probed automatically in one chucking on a

KINGSBURY



Case Study 3749

Three holes in this transmission valve cover . . . 5 operations . . . 350 parts per hour gross

The machine drills three holes in this aluminum die casting. The customer asked us to probe the tiny .078 hole as the best means of inspection. An air-actuated mechanical probe operates at the next station after this drilling. If the hole is not drilled, the probe trips a limit switch which stops the machine.

We pioneered in these indexing automatics and we still think we can build them better than anyone else. They will produce to your specifications. If you have critical high production drilling and tapping jobs, we'd like a chance to show you what we can do. Kingsbury Machine Tool Corporation, Keene, N. H.

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INDEXING AUTOMATICS
for high production drilling and tapping

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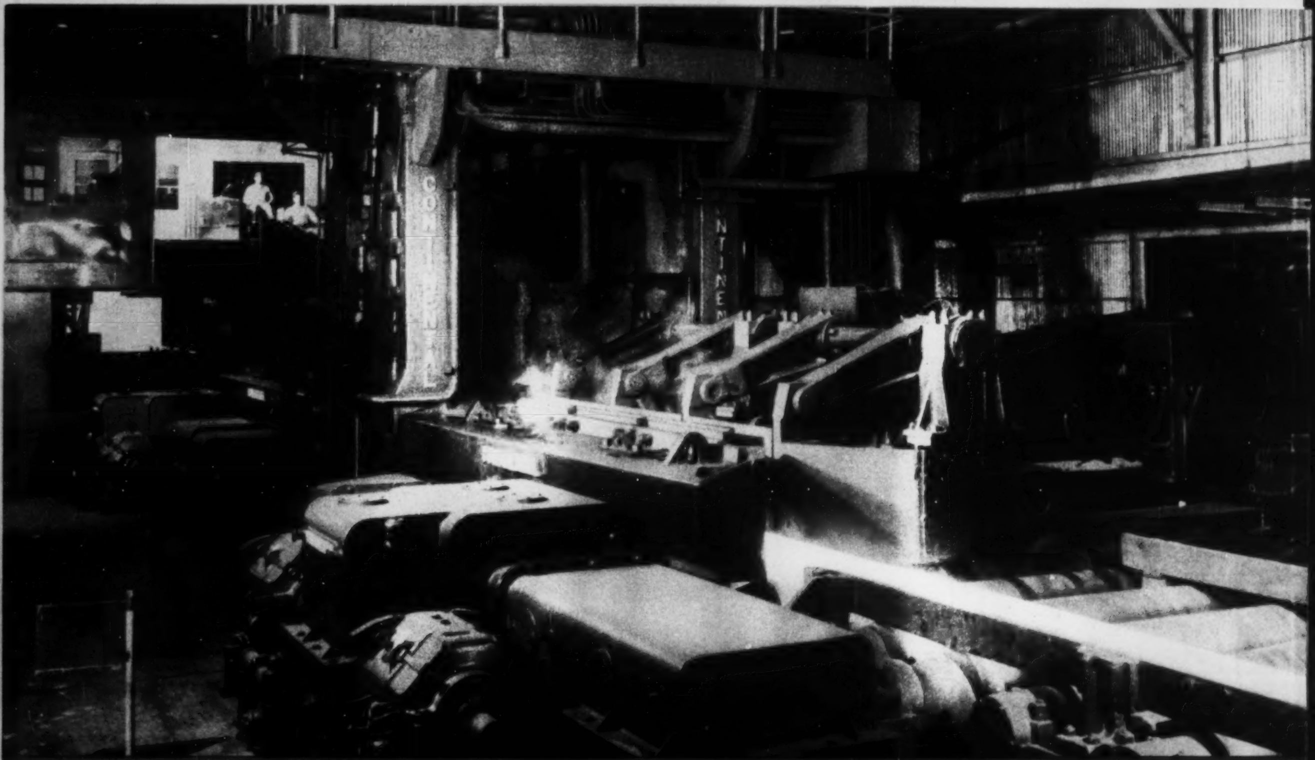
Grouped under the Blaw-Knox Foundry and Mill Machinery banner are the best known names in Metal Producing and Metalworking production equipment. These products, custom-designed and built for the highest standards of performance include: complete primary and finishing rolling mills, a comprehensive line of standard and special grade rolls, cold finishing equipment, castings for steelmaking, special high temperature alloy castings for heat treating and water cooled equipment for open hearth furnaces.

Behind each of these products is an engineering force and plant capacity that has no equal in industry. You can expect exceptional service from this integrated organization of machines and men who understand your production and market problems.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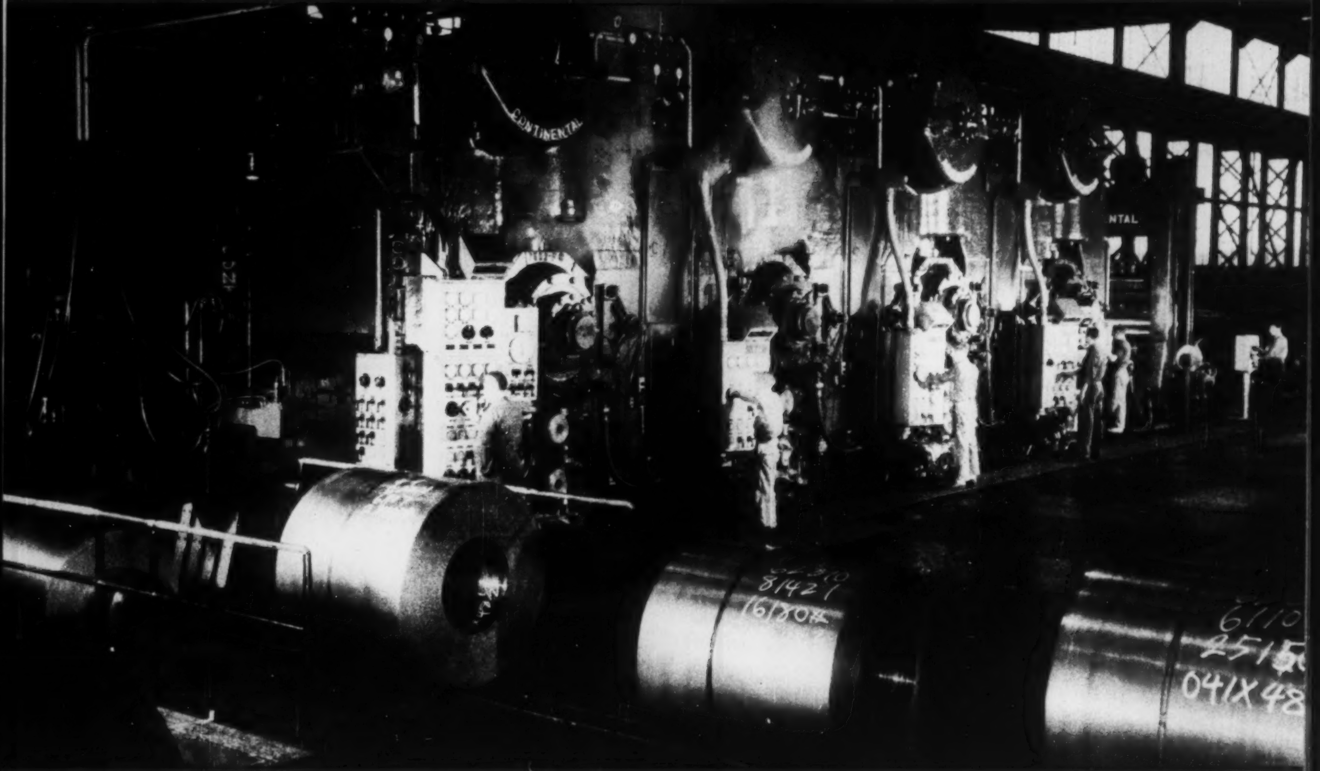
BLOOMING MILL—40-inch, 2-high reversing blooming-slabbing mill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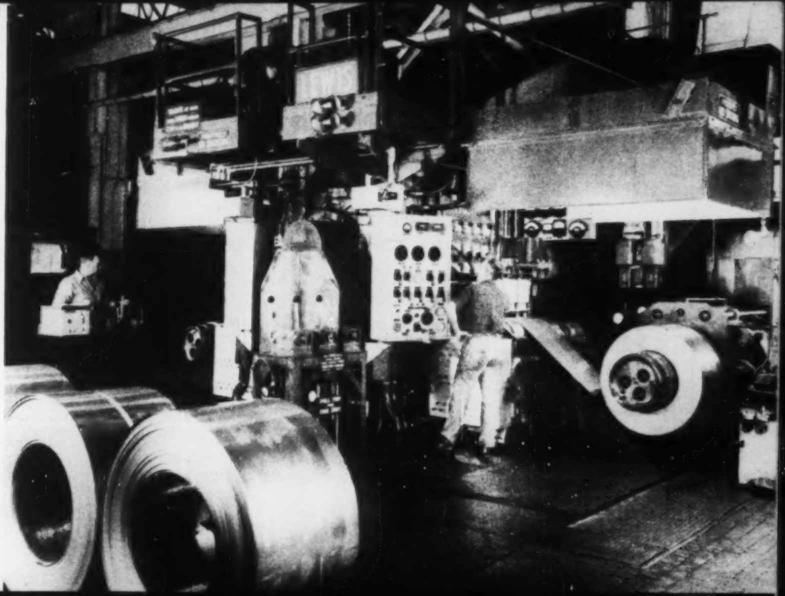
COLD MILL—High-speed 21" x 53" x 60", 4-stand tandem cold mill

Continental

In addition to complete mills for rolling all types of ferrous and non-ferrous metals, Blaw-Knox offers design, construction engineering, erecting and installation of the mill together with auxiliary equipment and special machinery. Thus you are assured of a single responsibility from preliminary engineering to satisfactory installation.

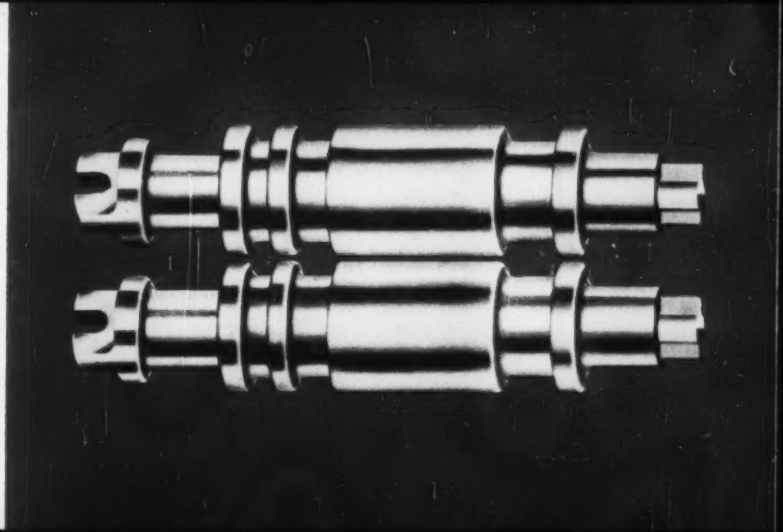
Lewis

Lewis four-high reversing cold mills for rolling thin metals provide built-in versatility combined with continuous control and high speed delivery. Representative of the line, this four-high reversing unit for the cold reduction of strip aluminum and copper-base alloys.



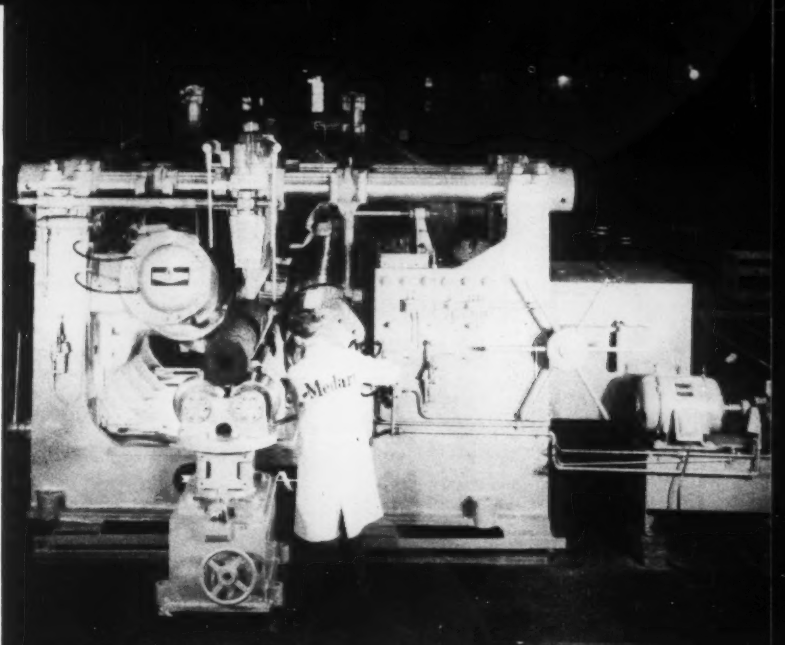
Rolls

More than 50 different grades of iron and steel rolls are regularly available from Blaw-Knox. These rolls bear such well known trade names as Continental, Lewis and Pittsburgh. In addition, Blaw-Knox roll engineers can recommend special types of rolls best suited to your requirements.



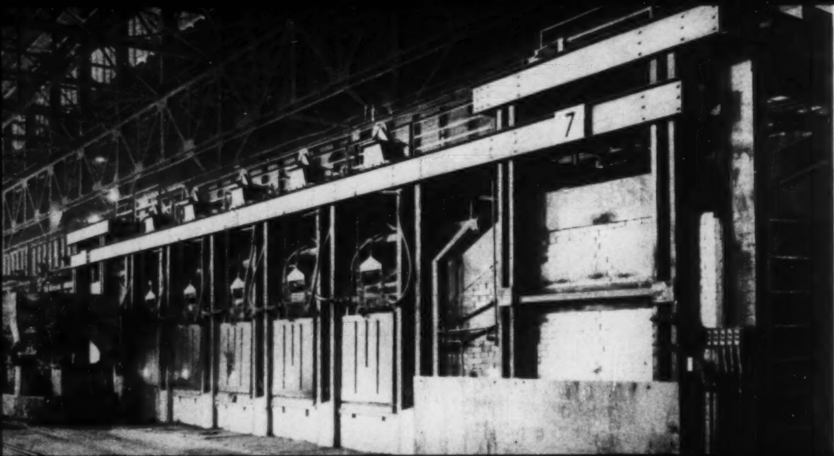
Medart

The most advanced and complete line of cold finishing equipment in industry. Shown here is one of the most widely used Medart machines, the 2-roll rotary straightening, sizing and polishing machine. To meet your special requirements, there's a Medart machine for billet peeling and chipping, sizing and polishing, centerless turning, straightening and roll grinding.



Castings

Blaw-Knox castings are in service in practically every segment of American Industry. Under the famous trade names, Union and Continental, their quality reflects a program of constant improvement and the use of the most modern Foundry techniques. Blaw-Knox engineers are ready to study your designs in order to provide the best casting at the lowest practical cost.



Steel Plant Equipment

Blaw-Knox water cooled equipment for use with high temperature furnaces provides a high degree of operational safety in rugged steel making operations. In addition, Blaw-Knox provides equipment such as dolomite machines, autopours, reversing valves and ladle addition feeders for use in mechanized steelmaking operations.

National Alloy

The problems of heat and corrosion have been successfully overcome throughout the metals industry with the use of National Alloy castings. The advanced metallurgical skills and production facilities of National Alloy are directed to the single goal of providing high alloy castings for maximum service under the severe operating requirements imposed by elevated temperatures and corrosive conditions.

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BLAW-KNOX COMPANY

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AMF
FEDERAL

up in the clouds...

When a Navy Training Plane points its nose skyward in defiance of gravity, everything from tip to tail must be a model of precision and endurance. Federal Ball Bearings are here, too, in the flexible drive assembly of this Lear actuating screwjack, which helps raise and lower the pilot's seat.

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Bowlers call it magic, the way the AMF Automatic Pinspotter sets 'em up—even replaces "off-spot" pins in their exact location after every roll. Federal Ball Bearings do their part in the gear boxes of these mechanical marvels.

so much of industry *turns* on FEDERAL ball bearings

Pilot's comfort or bowler's score. Production manager's quota or housewife's cake. All are important to those who design and build so many of the thousands of tools, machines and household appliances —with Federal Ball Bearings. 12,000 sizes. Hundreds of types. Produced by this 50-year-old manufacturer of ball bearings, *exclusively*.

When Federal Ball Bearings are part of so many things you *use*, shouldn't they be part of the things you *make*?

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Announces the acquisition of the

HYDRA-FEED
Lathe

(formerly manufactured by Hydra-Feed Machine Tool Corp.)

BULLARD

The name "Bullard" on machine tools dates back over three quarters of a century . . . to 1880. Bullard tradition stands for advanced engineering, quality of craftsmanship and reliable performance. These same attributes will continue to be our constant goal in the future.

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BRIDGEPORT 9, CONNECTICUT

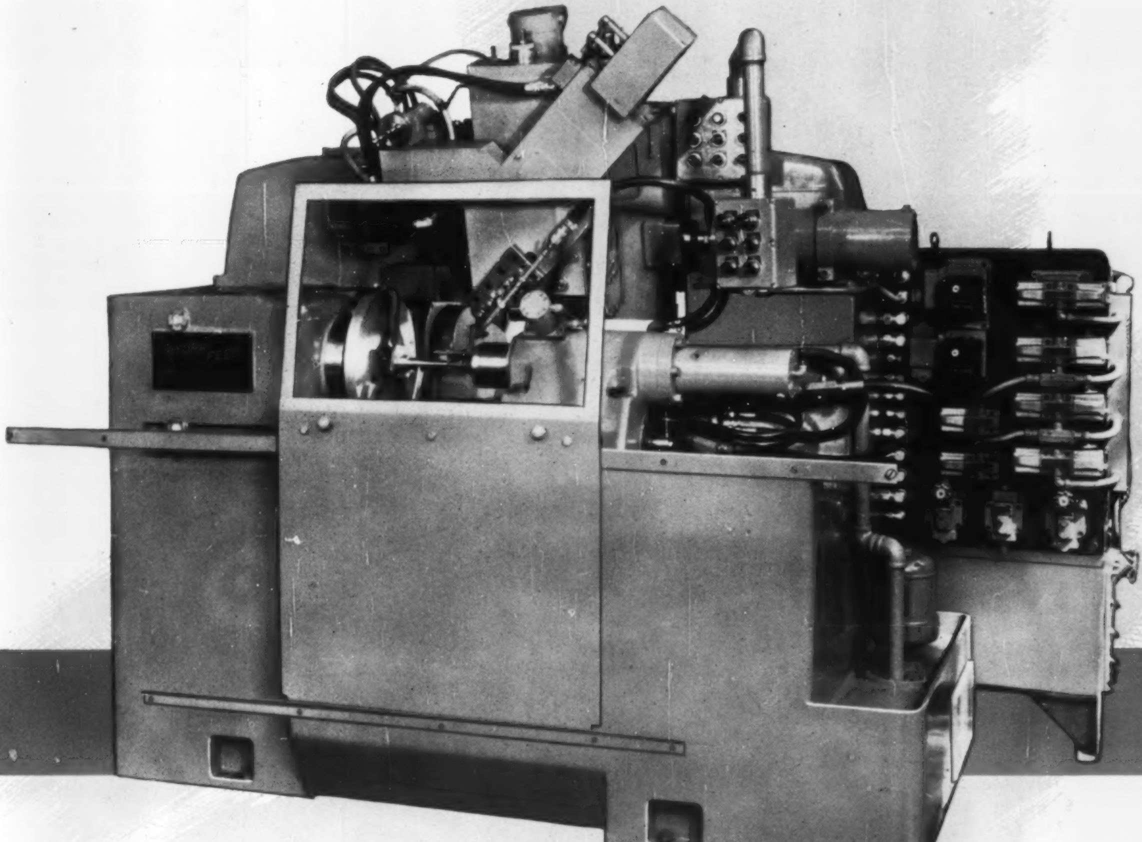
OUTSTANDING FEATURES INCLUDE:

Unobstructed front view design allows faster loading and unloading . . . easier set-up . . . with less operator fatigue.

When used as a tracer lathe templates are above work piece where dirt, chips and cutting oils cannot interfere with work accuracy.

Oversized chip chute with pan below the entire work area . . . readily accessible from end, rear or bottom of machine.

Massive strength and rigidity with extra power to take full advantage of maximum feeds and speeds obtainable with multiple carbide tooling.



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286 CANFIELD AVENUE, BRIDGEPORT 9, CONNECTICUT

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Now...
KENDEX*
boring bars

bring all the advantages of the Kendex principle to turret lathe boring operations

Exhaustive tests on different turret lathes** prove that Kendex Boring Bars provide all the benefits and economies of the Kendex principle now enjoyed in turning, facing, and milling operations. In addition, and probably more important in boring operations, Kendex Boring Bars provide the following advantages over other types of bars:

- **the cutting point is brought down to the center line of the bar**
- **greater support of the cutting edge is provided**
- **better chip control (uses standard Kendex chipbreaker plate)**
- **boring operations performed better at higher speeds made possible with Kendex bar**
- **permits use of thin insert—greater resistance to thermal shock**
- **throw-away insert permits use of harder grades—greater resistance to edge wear at higher speeds**
- **cutting inserts index accurately (saves time on size adjustment)—less downtime**

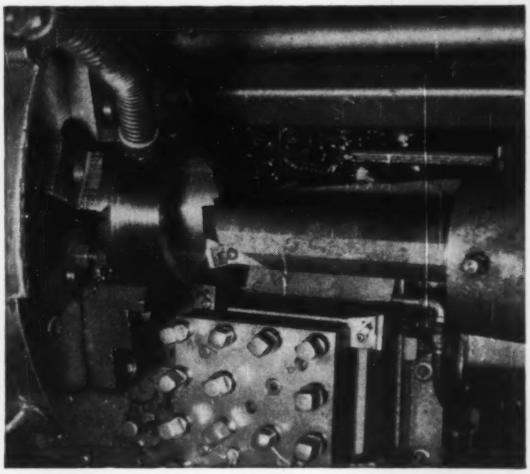
Kendex Boring Bars, with the right grade of "throw-away" Kennametal* insert, can be used for both rough and finish boring of pieces up to several inches in diameter. The bar with 15-degree lead angle and square insert together with the bar for turning to a square shoulder with a triangular insert will take care of practically all boring operations—thus eliminating the need for a variety of styles.

Why not call your Kennametal tool engineer to demonstrate these new Kendex bars? He will also help you select the right grade of Kennametal insert for each boring operation. Or write for additional information, KENNAMETAL INC., Latrobe, Pennsylvania.

*Trademarks

**Tests made on Warner-Swasey, Jones & Lamson, Gisholt and other turret lathes

C-3003



Kendex Boring Bars for Turret Lathes with Kennametal "throw-away" inserts . . . eliminate costly grinding . . . index accurately without resetting tool . . . reduce machine downtime . . . slash cost per cutting edge . . . resist thermal shock . . . permit boring to close tolerances . . . better chip control (chipbreaker not shown in illustration at top of page)

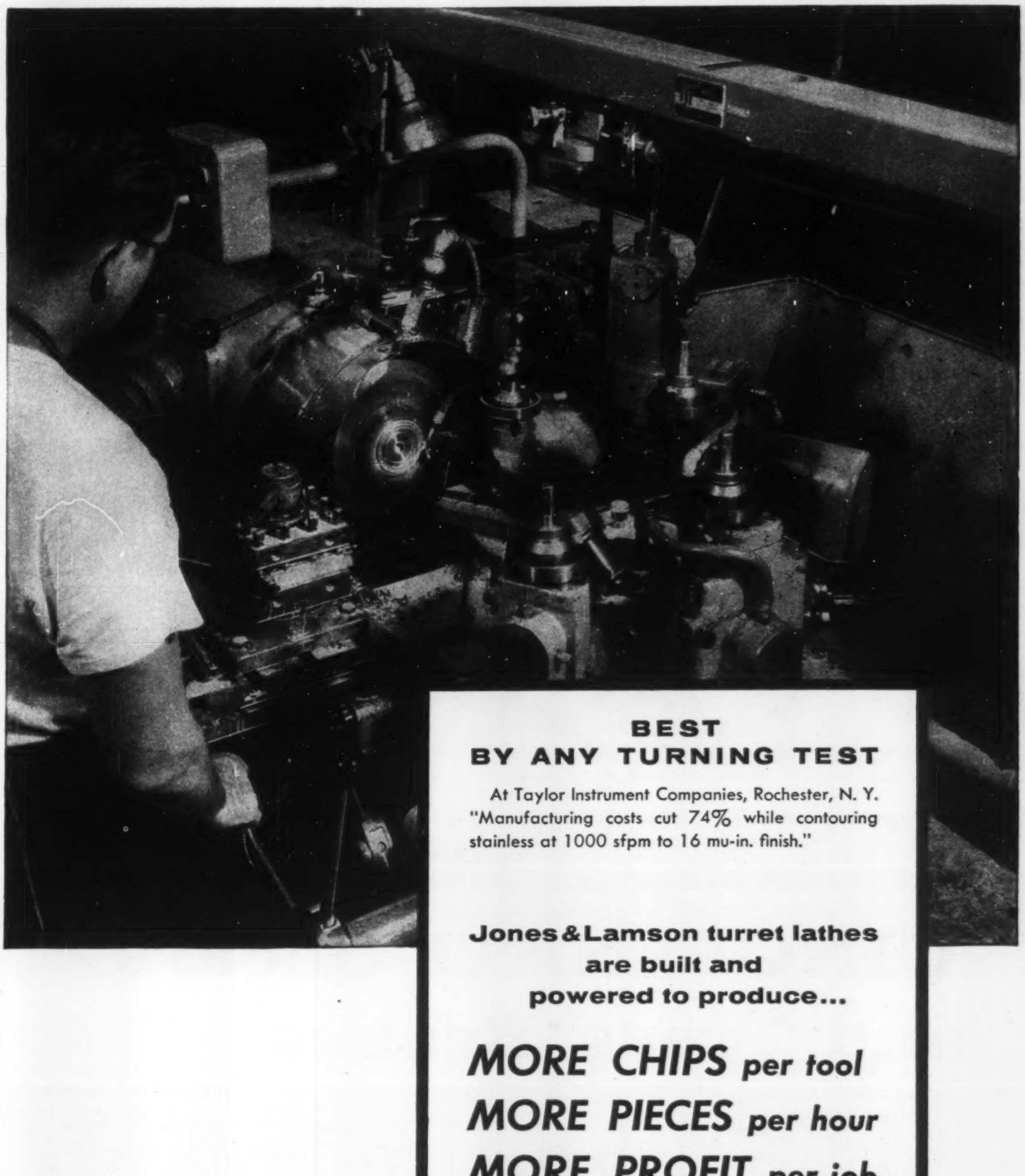
MINING, METAL AND WOODWORKING TOOLS

WEAR AND HEAT-RESISTANT PARTS

INDUSTRY AND
KENNAMETAL
...Partners in Progress

ABRASION, CORROSION-RESISTANT PARTS

PERCUSSION AND IMPACT PARTS



BEST
BY ANY TURNING TEST

At Taylor Instrument Companies, Rochester, N. Y. "Manufacturing costs cut 74% while contouring stainless at 1000 sfpm to 16 mu-in. finish."

Jones & Lamson turret lathes are built and powered to produce...

MORE CHIPS per tool
MORE PIECES per hour
MORE PROFIT per job

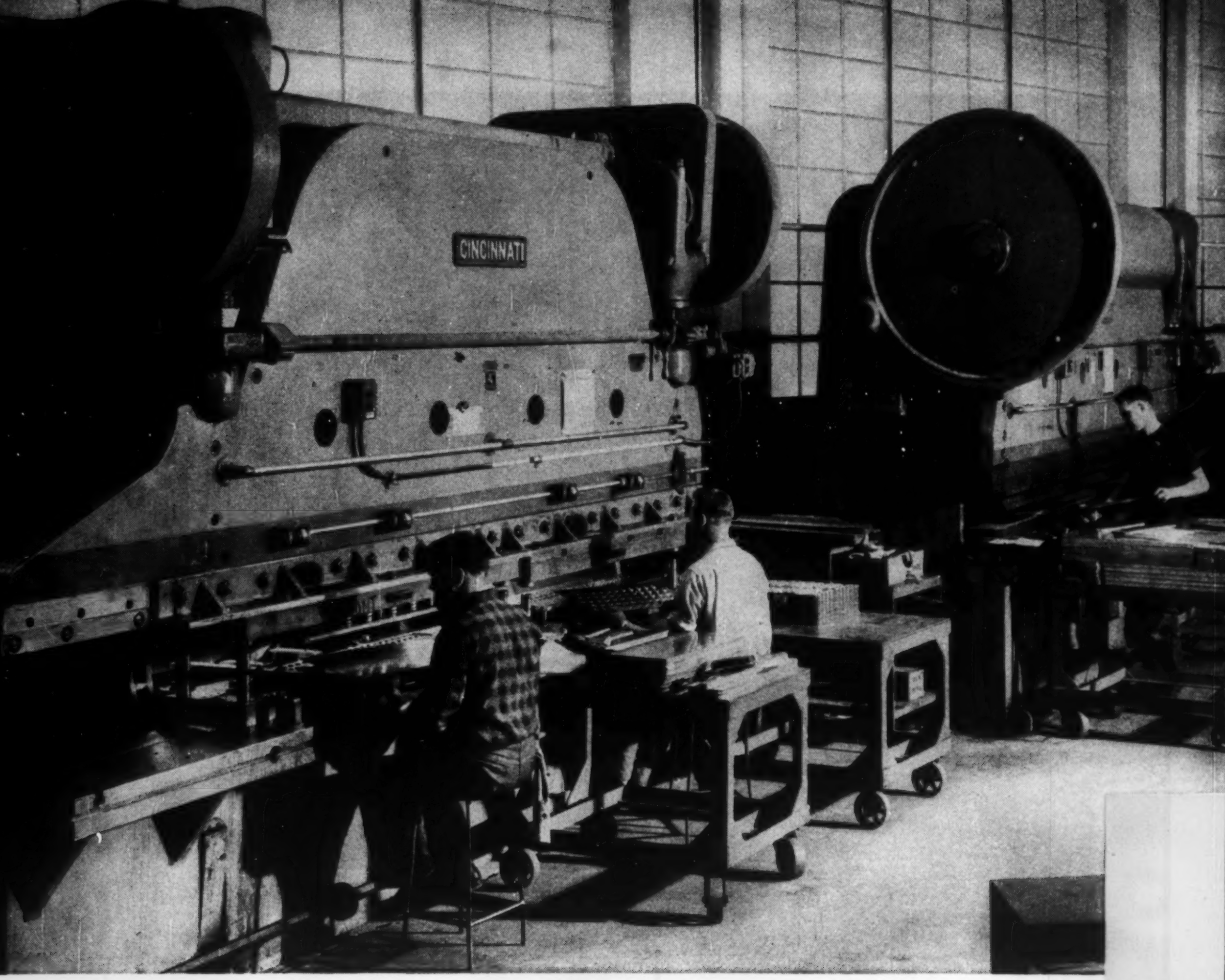
than any other turret lathe of comparable size!

Write Jones & Lamson for details

JONES & LAMSON

the man who needs a new machine tool is already paying for it

JONES & LAMSON MACHINE COMPANY, 517 Clinton St., Springfield, Vt., U.S.A. J&L **MACHINE TOOL DIV.**



BATTERIES of accurate CINCINNATI Shears and Press Brakes

cut production costs

at THE TRANE COMPANY, La Crosse, Wisc.

CINCINNATI

Steel tube support plate for cooling coils.

Three Cincinnati Shears and four Cincinnati Press Brakes are profitable producers in this finely equipped shop.

The battery of shears produces accurate blanks, sheared to micrometer accuracy, which are later formed and pierced on the Cincinnati Press Brakes.

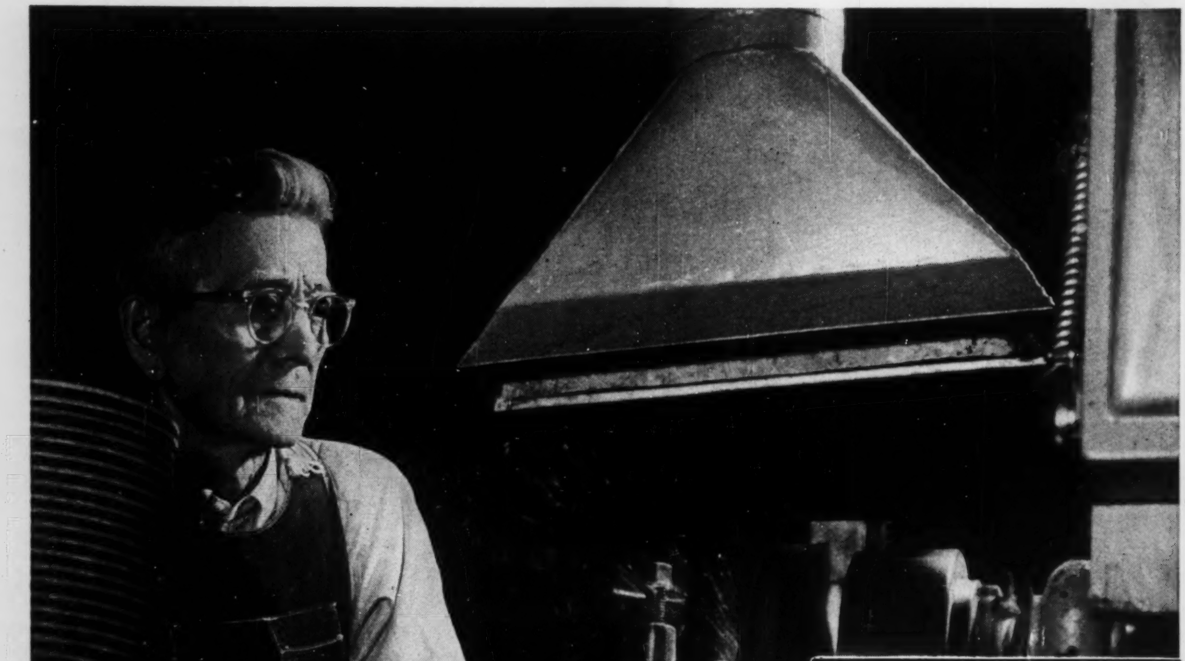
The photo at left shows multiple holes being pierced and extruded to a tolerance of ±.002″ in a steel tube support plate for Trane cooling coils. On this operation alone, floor to floor time ***was cut from 3-1/3 minutes to 1/2 minute*** by the use of Cincinnati Press Brakes. The speed and outstanding accuracy of these Cincinnati Machines have lowered costs and increased quality of the air conditioning equipment manufactured by this leading company.

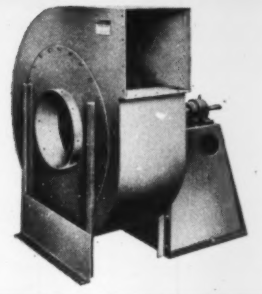
Write **Department C** for Catalog S-7R on Cincinnati All-Steel Shears and Catalog B-4R on Cincinnati Press Brakes. We also suggest you consult our Application Engineering Department about your shearing and forming problems.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A.

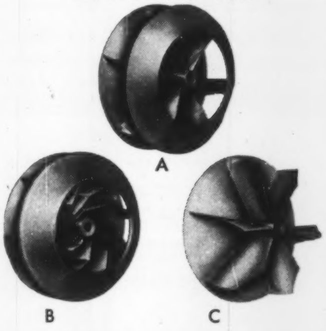
SHAPERS • SHEARS • BRAKES





Westinghouse Industrial Fans like this — equipped with material handling wheel, serve 150 machining operations at the Formica Plant.

3 WHEEL TYPES FOR:



(A) exhausting and conveying granular materials, chips, sawdust
(B) exhausting fumes, gases and light dust
(C) handling long stringy, fibrous material.

HOW TO GIVE DUST THE "AIR"

32 fan system removes 95% of fine dust generated by 150 micro-sanding and finishing machines.

At the Cincinnati Plant of Formica, a battery of 150 micro-sanding and finishing machines generate enormous quantities of fine dust hour after hour. Unchecked, it would be a health and efficiency hazard, as well as a costly cleaning and maintenance problem.

Kirk & Blum Manufacturing Co., Cincinnati, Ohio, foremost industrial air handling systems designers, specified 32 Westinghouse Industrial Fans. *Result:* Westinghouse fans pick up dust through individual hoods at each machine — give it an "air ride" to cyclone collectors outside.

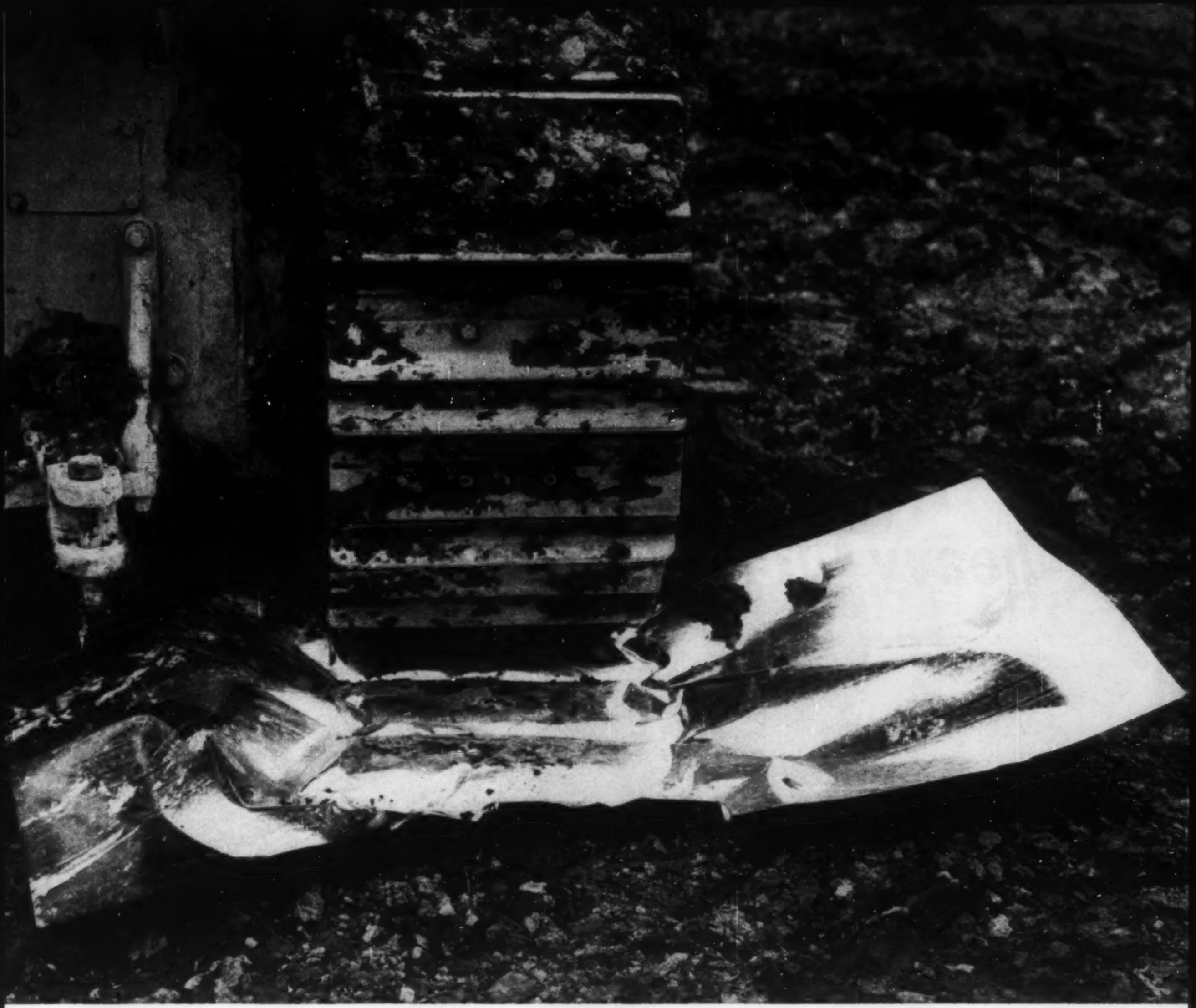
You can "Put Air To Work" in your plant *to end a hazard, help boost production, make it a better place to work.*

Call your nearest Sturtevant Division Sales Engineer for complete details, or write Westinghouse Electric Corporation, Dept. 3A, Hyde Park, Boston 36, Mass.

WESTINGHOUSE AIR HANDLING

J-80609

YOU CAN BE SURE...IF IT'S Westinghouse



WE TORTURED THAT WEIRKOTE® TILL IT HURT US TO LOOK!

The heavy tractor's treads crunched into the Weirkote steel, rocked back and forth, gave Weirkote's tight zinc coating a wicked test.

It passed perfectly.

Weirkote shrugs off punishment like that—or far worse—in everyday production. Its continuous-process zinc coating goes through all the severe fabrication steps flawlessly. Spin it, deep-draw it, crimp it, roll-form or extrude it. There's no flaking or peeling when Weirkote's on the job.

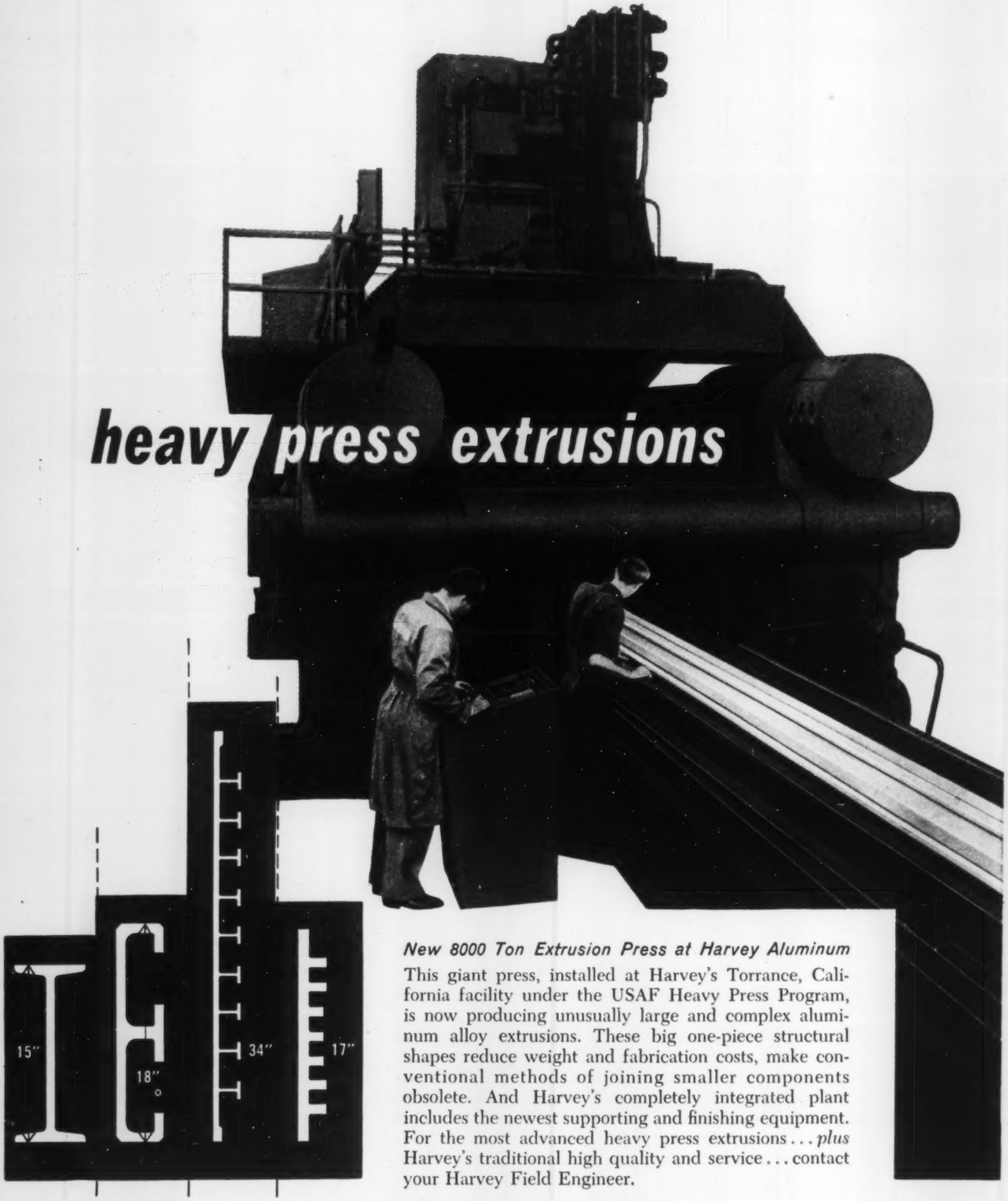
And look at this for savings! Because Weirkote's zinc coating stays put, you can eliminate the cost of plating, painting or redipping after fabrication. In many jobs, the lubricating property of the zinc coating will prolong die life, too.

Free Weirkote Booklet!
Send for all the facts on Weirkote.
Write Weirton Steel Company,
Dept. B-5, Weirton, West Virginia.

WEIRTON STEEL COMPANY

WEIRTON STEEL COMPANY
WEIRTON, WEST VIRGINIA
a division of
NATIONAL STEEL CORPORATION

heavy press extrusions



Heavy Press Extrusions now in Production

New 8000 ton press now permits greatest design flexibility. Wide, integrally stiffened skin panels . . . solid, hollow, and stepped extrusions . . . extra large complex shapes . . . can now be obtained from Harvey in all aluminum alloys and in heat-treated lengths up to 80 feet.

New 8000 Ton Extrusion Press at Harvey Aluminum

This giant press, installed at Harvey's Torrance, California facility under the USAF Heavy Press Program, is now producing unusually large and complex aluminum alloy extrusions. These big one-piece structural shapes reduce weight and fabrication costs, make conventional methods of joining smaller components obsolete. And Harvey's completely integrated plant includes the newest supporting and finishing equipment. For the most advanced heavy press extrusions . . . *plus* Harvey's traditional high quality and service . . . contact your Harvey Field Engineer.

Harvey is a leading independent producer of quality aluminum products in all alloys and sizes: Rod and bar, pipe, tube, hollow sections, press forgings, forging stock, impact extrusions, structurals, special shapes, extrusions, screw machine products and other aluminum products. Harvey is also producing similar items in titanium and steel.

Making the most of aluminum
. . . for everyone

HARVEY Aluminum

Harvey Aluminum Sales, Inc.
Torrance, California
Branch Offices in Principal Cities

'57 Show Dates Set

TWO shows will open the 1957 industrial exposition year on Jan. 28.

The American Road Builders' Association will sponsor its Road Show in Chicago's International Amphitheatre Jan. 28 through Feb. 2. Show Chairman Julien Steelman, president, Koehring Co., says visitors will see a revolution in equipment since the last show (1948).

"Good Maintenance or Bad—The Difference Is Profit" will be the theme of the eighth annual Plant Maintenance & Engineering Show in Cleveland's Public Auditorium, Jan. 28-31. Clapp & Poliak Inc., New York, will manage it.

The tenth biennial Western Metal Congress & Exposition will take place Mar. 25-29 in Los Angeles' Pan Pacific Auditorium. American Society for Metals is the sponsor.

Philadelphia will be host to three major industrial shows this spring. The first, Mar. 11-15, will be the 1957 Nuclear Congress which includes the Nuclear Engineering & Science Conference, Atomic Energy in Industry Conference, International Atomic Exposition and Hot Laboratories & Equipment Conference. Engineers Joint Council will co-ordinate this show. On Apr. 9-11, the American Welding Society's fifth Welding Show will move on the scene. It will be followed on Apr. 29-May 3 by the seventh national Materials Handling Exposition. Clapp & Poliak Inc. will manage this one. All three shows will be in Philadelphia's Convention Hall.

This year, the Design Engineering Show will be staged in New York's new Coliseum, May 20-23. Clapp & Poliak Inc. is handling this show, too.

The packaging industry's national Industrial Packaging & Handling Exposition will take place Oct. 28-31 in Convention Hall, Atlantic City, N. J. Its sponsor: Society of Industrial Packaging & Materials Handling Engineers. Hanson & Shea, Inc. will manage the show.

Chicago's International Amphitheatre will be the scene of American Society for Metals' annual National Metal Exposition & Congress in '57. The dates: Nov. 2-8.

For other major meetings and exhibits in 1957, see page 431.

manual, oil or air-actuated ...for unbiased* friction clutch recommendations, consult Twin Disc!

Manually-Actuated

Oil-Actuated

Air-Actuated

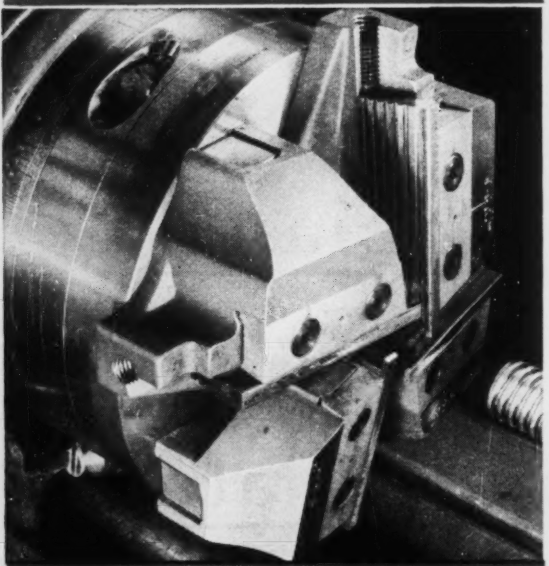
***** *Unbiased recommendations* . . . because whether your operation calls for a manual-, oil-, or air-actuated clutch, all are available from Twin Disc. More important, Twin Disc also makes a complete line of fluid drives, including torque converters—both single-stage and three-stage—for applications from 30 to 1000 hp . . . as well as fluid couplings for engines and motors from ¾ to 850 hp. For every industrial power transmission requirement—friction or fluid—consult Twin Disc *Specialists*.

TWIN DISC

Friction Clutches and Fluid Drives

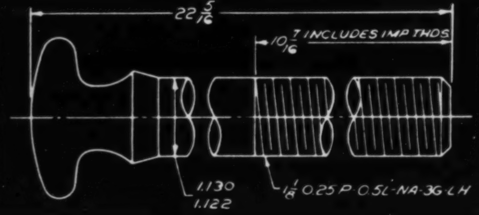
TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

Branches or Sales Engineering Offices: Cleveland • Dallas • Detroit • Los Angeles • Newark • New Orleans • Tulsa

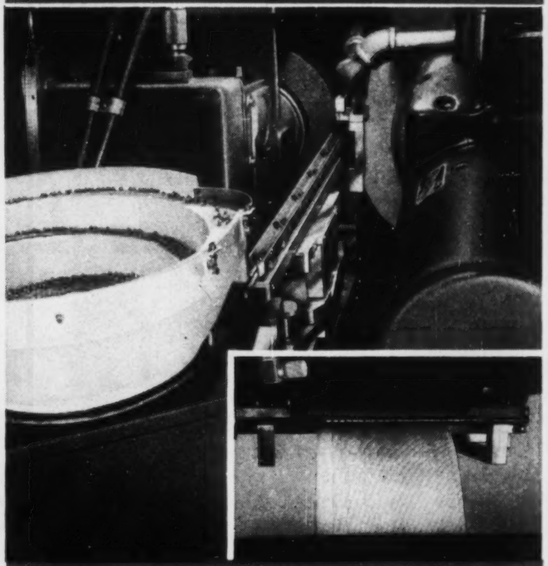


Cutting

Workpiece:	Valve Stem
Thread Spec.:	
Diameter	1-1/8"
Length	10-7/16"
Type	1/4"P, 1/2" lead, double left-hand Acme
Tolerance	Class 3
Threading Time:	24 sec.

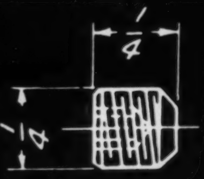


Threading is by the new 16C LANDMACO Single-Spindle Leadscrew Threading Machine fitted with 2" LANCO Heat-Treated Head using Roughing and Finishing Chasers with Centering Throats. This equipment is designed to produce a thread of excellent finish despite heavy metal removal, and eliminate the out-of-roundness common in long workpieces. Long life between grinds of the LANDIS Tangential Chasers for 80% of their length will hold tool cost to a minimum.



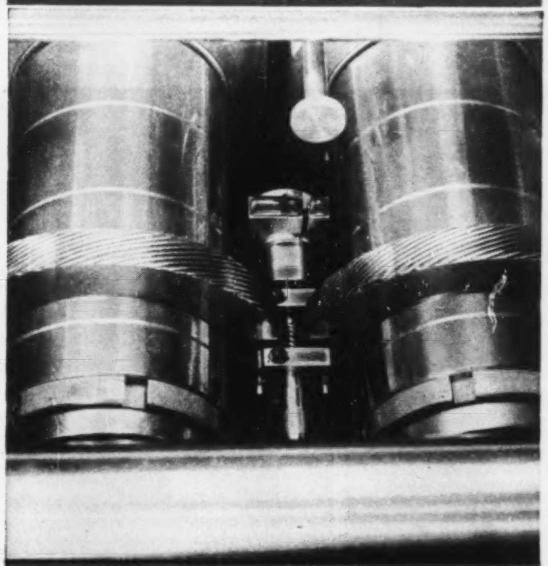
Grinding

Workpiece:	Set Screw
Thread Spec.:	
Diameter	1/4"
Thread length	1/4"
Type	20P-U.N.C.
Tolerance	Class 3
Production:	7,500 pieces per hour



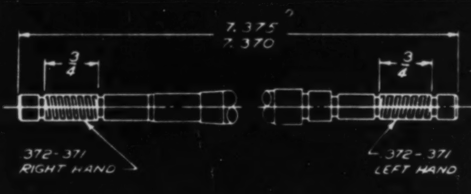
Threading is performed by continuous thru-feed grinding on a #1 LANDIS Centerless Thread Grinder. Operation is automatic—blanks are fed by a vibratory hopper—finished pieces ejected into a tray. This operation indicates the mass production possibilities of the centerless thread grinding method. Infeed grinding may be used for many shouldered workpieces which may not be threaded satisfactorily by either Cutting or Rolling.

443-C-



Rolling

Workpiece:	Worm shaft (50 carbon alloy steel of 25 Rockwell C)
Thread Spec.:	
Diameter	3/8"
Length	3/4"
Type	Triple worm, .100" P, .300" lead
Tolerance	.003 concen. with main bearing journals
Production:	12 pieces per minute



These worms are produced by infeed rolling on the new LANHYROL Thread Rolling Machine. Featuring manual loading and semi-automatic cycling, this operation illustrates the difficult threads which can be rolled to provide tremendous cost savings. Thrufeed, continuous and reciprocal rolling methods are also available when required by conditions of material hardness or workpiece design. Special fixtures and automatic loading mechanisms facilitate high production operations.

THREADING..

As a result of more than 50 years of Engineering, Research, and Production Experience, LANDIS offers the most complete line of machines and tools for producing threads:

CUTTING

THREADING MACHINES—90 sizes and styles for precision threading from 3/16" to 6", and pipe threading from 1/8" to 20".

DIE HEADS—102 sizes and styles featuring the LANDIS Tangential Chaser for economy in commercial and precision threading on all types of machines. Capacities from #4 to 9-1/4" in diameter.

COLLAPSIBLE TAPS—130 sizes and styles of stationary and rotary taps, for taper or straight threading, with a range from 1-1/4" to 24".

GRINDING

Centerless Thread Grinders to thread all diameters from #4 to 3-1/2", utilizing either in-feed or thru-feed grinding.

ROLLING

THREAD ROLLING MACHINES—the LANHYROL Machine threads all diameters from 3/16" to 3" by the chipless, cold-forming process; and offers unequalled output, flexibility, and range coverage.

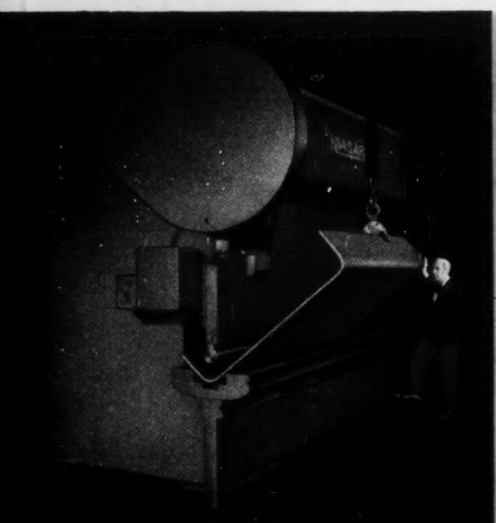
THREAD ROLLING ATTACHMENTS—five sizes of the LANROLL Attachments for bar automatics produce straight threads to Class 4 tolerances from #5 to 1-3/4", and taper pipe threads from 1/16" to 1-1/4".

May we suggest the most efficient method of producing your thread? LANDIS Engineers will work with you on any problem dealing with method, equipment, or thread design. Our staff of Field Representatives assure you of satisfactory operation—and, in addition, all LANDIS Equipment is guaranteed to produce the thread for which it is sold.

LANDIS *Machine* COMPANY
WAYNESBORO • PENNSYLVANIA • U. S. A.

In plate or sheet metalworking . . .

NIAGARA MACHINES CAN

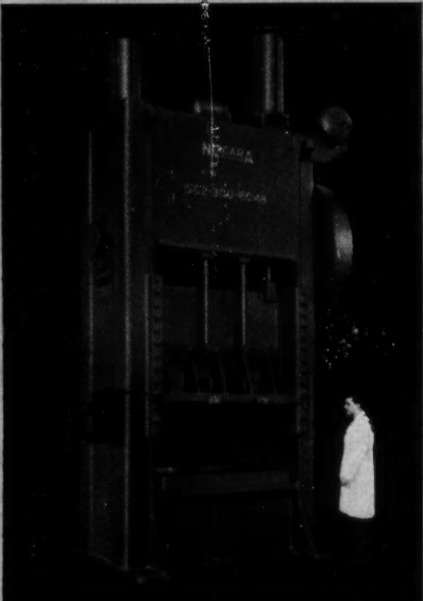


PRESS BRAKES
50 - 775 ton capacities.

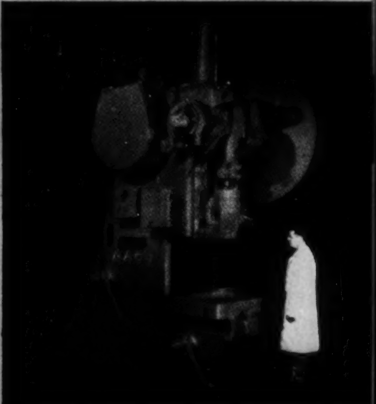
COMBINATION CIRCLE SHEARS AND FLANGES
High speed machines handling a wide range of medium to heavy work.

GAP FRAME DOUBLE CRANK PRESSES
3 - 6½ inch shaft diameters.
48 - 222 ton capacities. Also, inclinable series.

BENDING ROLLS
Hand and power driven for a wide range of lengths and thicknesses.

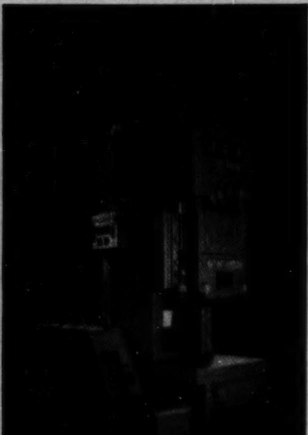


STRAIGHT SIDE DOUBLE CRANK PRESSES
50 - 300 ton capacities.



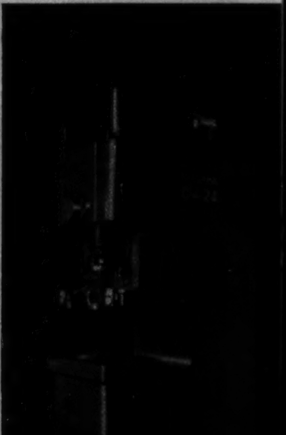
SINGLE CRANK OPEN BACK INCLINABLE PRESS
1¼ - 7½ inch shaft diameters.
7 - 250 ton capacities.

STRAIGHT SIDE ECCENTRIC GEARED PRESSES MODIFIED AND EQUIPPED FOR AUTOMATION
1, 2 and 4 point suspension.
100-1000 tons.



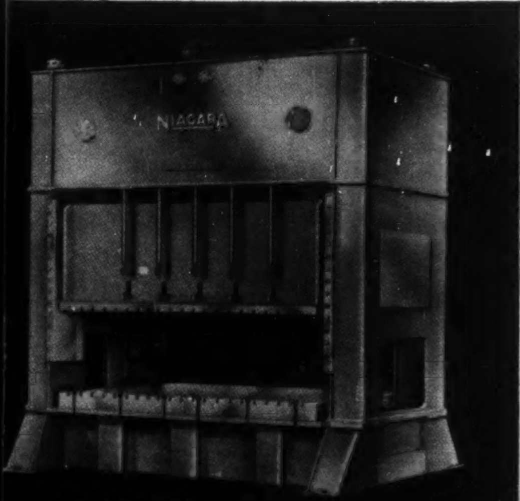
FRONT-TO-BACK CRANKSHAFT OPEN BACK INCLINABLE PRESSES
Standard and automation models.
75-200 tons.

FRONT-TO-BACK CRANKSHAFT ADJUSTABLE BED PRESSES
Standard and modified models.
22-150 tons.



FRONT-TO-BACK CRANKSHAFT DEEP THROAT PRESSES
22-150 ton capacities

DO THE MOST* FOR YOU



STRAIGHT SIDE ECCENTRIC GEARED PRESSES
One, two and four-point suspension.
100 - 1000 ton capacities.

UNDERDRIVE POWER SQUARING SHEARS
Shim stock to 1 inch capacities in
lengths from 3 - 20 feet.

* MOST EXTENSIVE LINE:

From giant, power-operated machinery to small hand tools

* MOST ADVANCED DESIGNS:

Years ahead in performance through forward-thinking engineering

In the world's largest automotive and appliance plants or the smallest of sheet metal shops, Niagara machines and tools are usually at work "in force."

Batteries of giant presses are teamed up with speedy ring and circle shears. Massive, rugged press brakes stand side-by-side with powerful bending rolls and squaring shears. Versatile lever punches, rotary machines, groovers and seamers . . . all operate together to produce a better product at lower cost. The Niagara lines are "companion lines" of metalworking machines and tools that work together. A Niagara-equipped shop or plant is years ahead in quality and volume of production.

Whatever you require — power presses or hand tools — Niagara is the line that can do the most for you. It is the most complete in the industry . . . the most advanced in engineering. You can consult a Niagara representative with complete confidence of unbiased recommendations. Niagara has the right machines and tools for your requirements.

NIAGARA

America's Most Complete Line of Presses,
Shears, Machines and Tools
for Plate and Sheet Metal Work

POWER PRESSES • PRESS BRAKES • POWER SQUARING SHEARS • ROTARY MACHINES • SLIP ROLL FORMERS • POWER ROTARY SHEARS • DRUM MAKING EQUIPMENT • ELECTRONIC AUTOMATIC WELDERS • GROOVERS AND SEAMERS • HAND OR FOOT OPERATED SHEARS • FOLDERS-BRAKES • LEVER SHEARS AND PUNCHES • HAND TOOLS

BRING YOUR FILES UP-TO-DATE WITH INFORMATIVE NIAGARA BULLETINS

A diversified and extensive list of machines and tools make up the famous Niagara line. Some of the principal types are illustrated. Be sure that you have the latest data on the ones that apply to your work. At your request, specific Bulletins will be mailed promptly.

NIAGARA
NIAGARA
NIAGARA
POWER

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.
DISTRICT OFFICES:
Buffalo • Cleveland • Detroit • Indianapolis • New York • Philadelphia
Distributors in principal U. S. cities and major foreign countries

"built to serve the growing West"

There's a new word in our slogan!

Keeping pace with the West's rapid growth, Kaiser Steel is now going forward with the biggest expansion in its history—a $113,000,000 program that will increase steel production by 40 percent—bringing into operation by 1958 more new steel production and finishing capacity than was built into the original Fontana plant during the war years 1942-45.

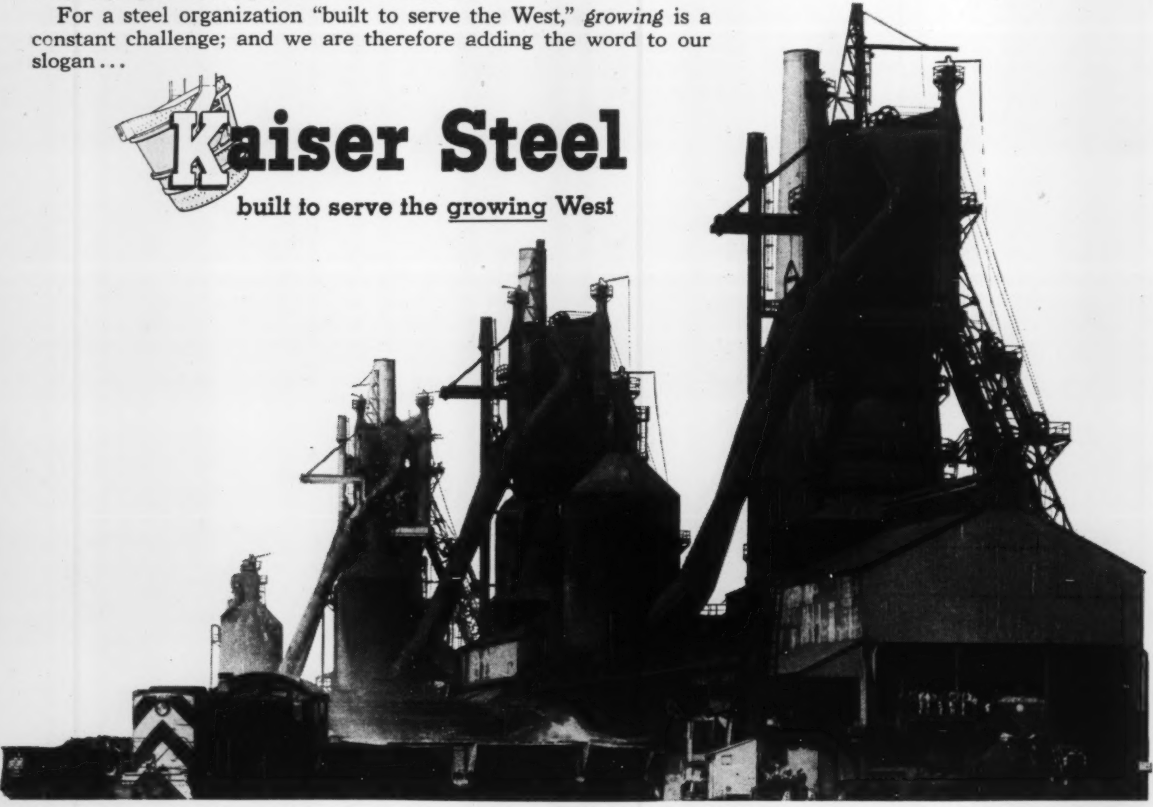
This is Kaiser Steel's vote of confidence in the continued growth of the West.

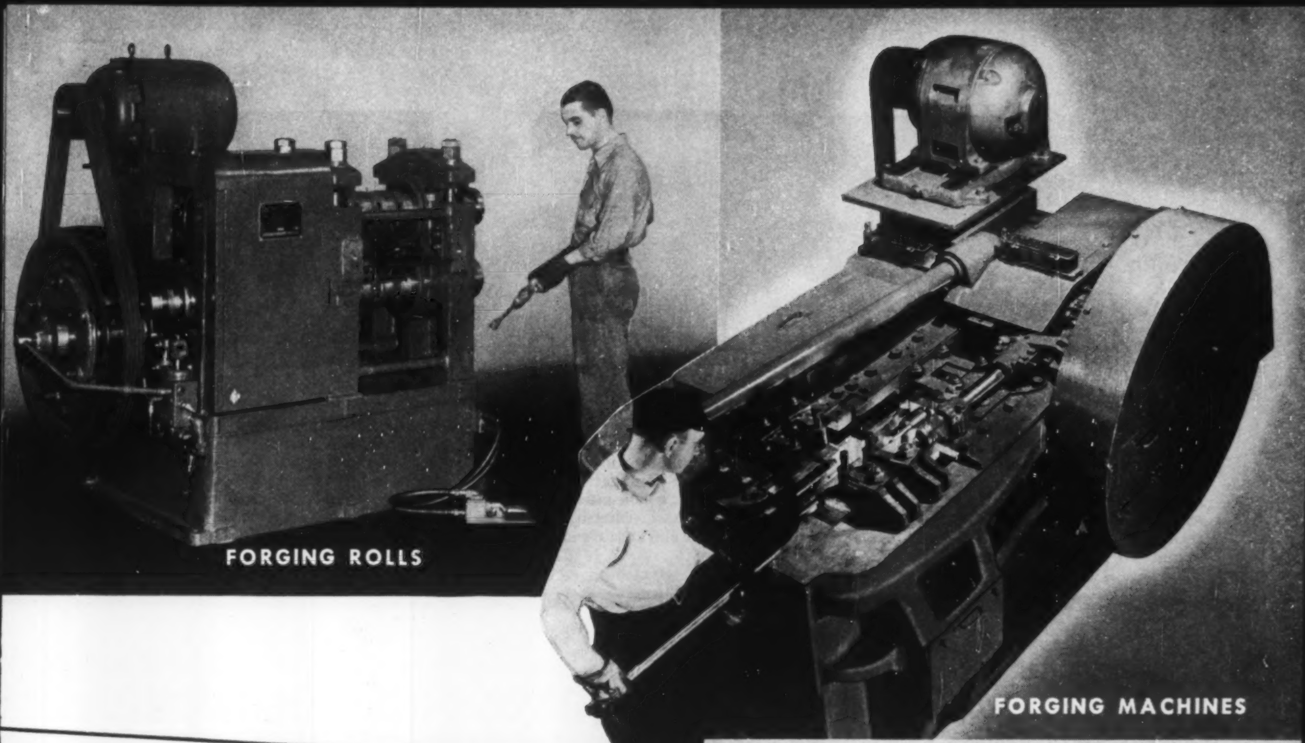
Previous expansion programs have made Kaiser Steel the West Coast's largest, most diversified steel producer—operating the only fully ingregated steel plant on the West Coast.

For a steel organization "built to serve the West," *growing* is a constant challenge; and we are therefore adding the word to our slogan...

Kaiser Steel

built to serve the growing West





FORGING ROLLS

FORGING MACHINES

AJAX
FORGING MACHINERY

— *Air Clutch Operated* —

FOR

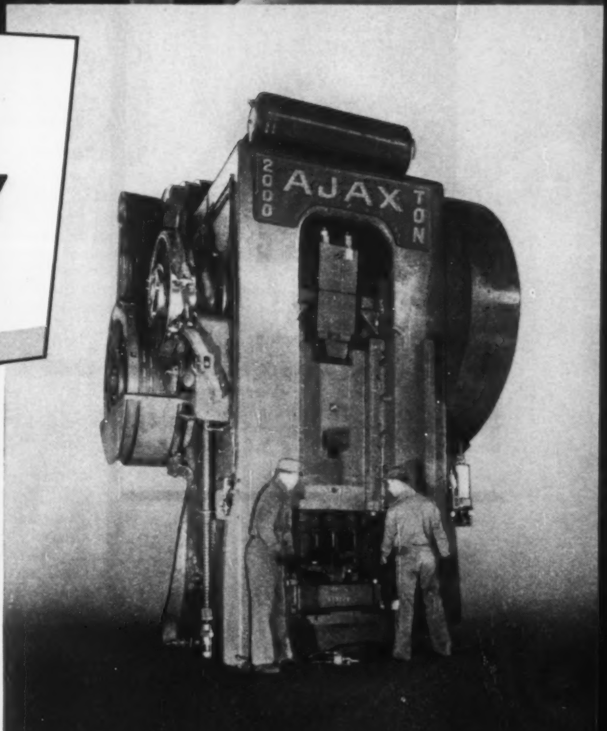
High Production

For speed in production . . . for accuracy of the forged part . . . and for capacity . . . AJAX provides a complete line of Forging Presses, Forging Machines, and Forging Rolls of the most advanced design ever offered to Industry.

Great rigidity, power and excellent alignment of these machines makes possible the production of uniformly accurate forgings with a minimum of machining.

Instantaneous response of the Air Clutch to the operator's control completes many multi-stage forgings in one heat and improves die life. Smooth, cushioned starting at high speed assures long machine life.

Write for descriptive bulletins



FORGING PRESSES

AJAX **METAL WORKING MACHINES**

Forging Presses • Forging Machines • Forging Rolls

Ajax-Hogue Wire Drawers • Continuous Drawing & Straightening Machines

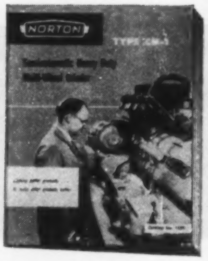
THE AJAX MANUFACTURING COMPANY CLEVELAND 17, OHIO
110 S. DEARBORN ST., CHICAGO 3, ILL.
W. P. WOOLDRIDGE CO. • BURLINGAME, CAL. • LOS ANGELES 22, CAL.

CYLINDRICAL GRINDERS

10" Type CTU and 14" Type LCTU. Semiautomatic or plain. For plunge or traverse operations, from roughing cuts to finest finishing. Can take a wide range of multi-wheel mounts. In production line and job shop work these machines have doubled production, replaced several machines, eliminated extra operations. *Catalog No. 1787*

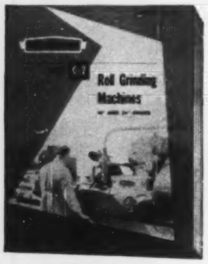
Semiautomatic
Angular
Wheel Slide
Cylindrical
Grinding
Machines

10" Type CV-4 and 14" Type LCV-4 Angular Wheel Slide. Semiautomatic machines that grind thrust surfaces and adjacent diameters in one fast, automatic plunge operation. They leave a concentric grain pattern in the thrust surface finish, assuring a better seal surface and appearance. *Catalog No. 1658*



Type CM-1 Heavy Duty Multi-Wheel. Semiautomatic. Makes four or more cuts simultaneously, in a single plunge-grind cycle. Brings new speed, accuracy and economy to the grinding of multi-diameter parts. Many automatic features, including one-lever control. *Catalog No. 1550*

ROLL GRINDERS



Type C-2. A heavy duty machine, featuring faster cutting, quicker set-ups, easier operation. Available as a plain, semiautomatic or roll grinder. One-lever control of grinding cycle on the semiautomatic. As a roll grinder it includes the famous Norton tilting wheel head. *Catalog No. 1827*

CAM GRINDERS

NORTON
No. 3
CAM-O-MATIC
AUTOMATIC
HYDRAULIC
CAM GRINDER

NO. 3 CAM-O-MATIC Cam Grinder.* An automatic, hydraulic machine that is setting new standards for production, precision and finish. Grinds all cams and the camshaft eccentric successively and automatically, in one handling. Entire operation geared to split-second efficiency. *Catalog No. 191*

Check these guide books to

bigger
grinding
profits

Get the facts on how Norton grinding machines can benefit your production

In building the world's largest line of grinders and lappers — including automatic machines and machines for specialized operations — Norton offers you the greatest opportunities to modernize.

A representative selection of Norton machines is listed here, together with their catalogs. It will pay you to send for any catalog that concerns your grinding or lapping operations. Learn how replacing your obsolete equipment with new Norton machines will enable you to meet competition with the best production tools in the field. Learn also, how the Norton Lease and Financing Plans enable you to modernize, yet conserve your capital.

Ask your Norton representative for the literature you want, or write direct. And remember: only Norton brings you such long experience in both grinding machines and grinding wheels — to bring you the "Touch of Gold" that helps you produce more at lower cost. Norton Company, Machine Division, Worcester 6, Mass.

CRANKPIN GRINDERS

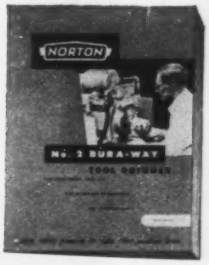
NORTON
Transfer Type Crankpin Grinder

Automatic Transfer Type. For completely automatic crankpin grinding — a newsmaking Norton "*first.*" Locates, grinds, gages, transfers — all automatically — cutting costs on each crankshaft ground. Typical of Norton's rapid progress in automatic operation. *Catalog No. 1837*

CUTTER AND TOOL GRINDERS

NORTON
No. 20

No. 20 Cutter And Tool Grinder. Fastest, most versatile machine in its class. Wheel head tilts 15° above or below horizontal and swivels through 360°, simplifying many difficult grinding jobs. Easy to set up, operate and maintain. *Catalog No. 189*



No. 2 BURA-WAY Tool Grinder.* Unequalled for grinding convex single point and form tools. Generates, produces and maintains relief angles constant in the direction of the feed. Duplicates the master tool form exactly. Extends the life of carbide-tipped and other tools. *Catalog No. 220*

UNIVERSAL GRINDERS

NORTON
Type U-4
Universal
Grinding Machine

Type U-4, 12" x 36" and 12" x 48". Quick, easy set-ups plus fast grinding action save time and costs on a wide variety of external, internal, face and angular wheel-slide jobs. Simply turning a dial gives an infinite number of works speeds over its 40 to 400 rpm range. *Catalog No. 231*

LAPPERS

NORTON
HYPROLAP
high production
lapping machine

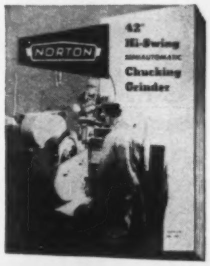
HYPROLAP Lapping Machine No. 48F.* An extremely fast, high production machine for single or parallel face flat lapping. Bonded abrasive laps produce work pieces free of grit. Three arrangements: plain, timed cycle; automatic continuous feed; semiautomatic continuous feed. *Catalog 1954*

VERTICAL
LAPPING
MACHINE

Vertical Lapping Machine No. 16FC. Outstanding productive capacity for flat work up to 3" x 5" and cylindrical work up to 3" diameter. Can produce optically flat surfaces and diameter tolerances in millionths, with fine repetitive accuracy. *Catalog No. 212.*

SPECIAL GRINDERS

42" Hi-Swing Semi-Automatic Chucking Grinder. For rapid, accurate grinding of large diameter, short parts, such as jet engine compressor wheels and similar components. Takes work held by chucks, face plates or special fixtures and permits grinding several surfaces without disturbing the set-up. *Catalog No. 1780.*



*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

SURFACE GRINDERS

NORTON
MACHINES

8" x 24" Hydraulic. Grinds plane surfaces speedily and economically, in large stock removal or close tolerance operations. Designed with both hand and hydraulic table cross feed. Convenient controls and easy accessibility reduce operating and maintenance time. *Catalog No. 190*

To Economize, Modernize with NEW

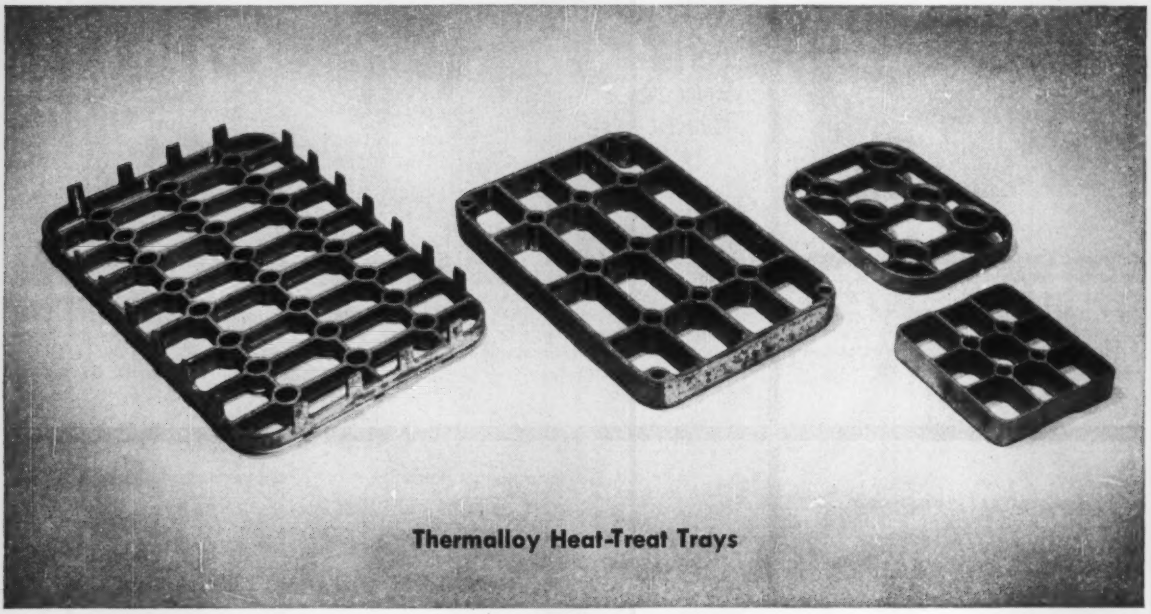
NORTON

GRINDERS and LAPPERS

Making better products... to make your products better

District Offices: Worcester • Hartford • New York Area,
Teterboro, New Jersey • Cleveland • Chicago • Detroit
In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5

WHAT'S YOUR HEAT-TREAT PROBLEM?



Thermalloy Heat-Treat Trays

For cost-saving answers...look to

Thermalloy*

Let us show you how to cut heat-treat costs with parts cast of Thermalloy!

Tough, heat-resistant Thermalloy is not just one alloy, but a *group* of alloys—each developed to meet a specific heat problem, whether it be high or indeterminate stress, thermal fatigue, oxidation or chemically reactive media.

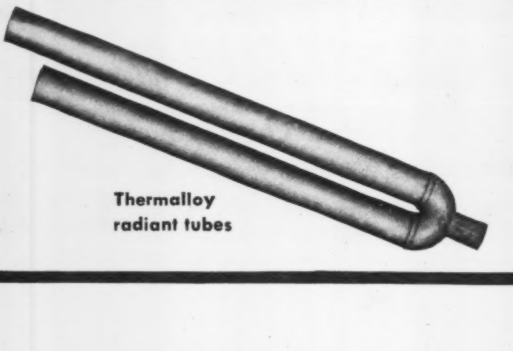
At Electro-Alloys, an experienced metallurgical and engineering staff is available to help you put Thermalloy's qualities to work, to increase the life of your heat-treat parts. They can specify the type of Thermalloy best suited to your particular need and also contribute helpful design suggestions on your heat-treat parts.

Call your nearby Electro-Alloys representative. Or write for Bulletin T-225, Electro-Alloys Division, 8041 Taylor St., Elyria, Ohio.

*Reg. U. S. Pat. Off.

ELECTRO-ALLOYS DIVISION · Elyria, Ohio

AMERICAN Brake Shoe COMPANY



Thermalloy radiant tubes

Thermalloy conveyor belt

More tin plate . . . mirror finish, precise alloy

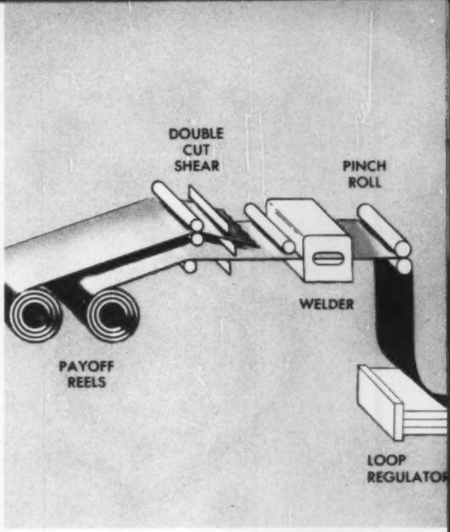
Westinghouse line drive and control equipment for exacting, high-speed reflow methods helps your electrolytic tinning lines produce more salable tin plate . . . faster.

Here's how you can give your tin plate a competitive edge →

YOU CAN BE SURE... IF IT'S Westinghouse

With Westinghouse radio-frequency equipment . . .

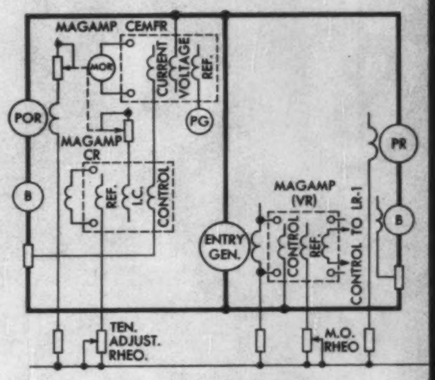
Smooth, lustrous tin plate at speeds of 2100 fpm, and beyond



Westinghouse equipment for tin-plate reflow operations helps you produce the delicate alloy balance necessary to form tin cans easier, maintain high production rates.

Westinghouse radio-frequency induction heating equipment for high-speed lines . . . both horizontal and vertical acid type . . . keeps coating thickness precise and constant by automatically adjusting plating current in proportion to line speed. Electromagnetic induction, transferring power to the strip without physical contact, melts the tin and creates a bright, nonporous surface.

This process works so fast that it produces an actual flow line on the moving strip. A photoelectric scanner continuously scans the flow line and uses it to maintain heating at the precise, desired level. There's no overheating or underheating . . . the electric equipment is capable of maintaining speeds of 2100 fpm and beyond. You save valuable tin, reduce menders and boost output of prime tin plate. Production scheduling is simplified because photoelectric scanner handles most changes in gauge and speed without adjustment.



How Line Control Operates

Magamp* magnetic amplifier regulators (VR) control voltage of the entry, main and delivery generators assuring fast, even acceleration and deceleration and minimum loop variation during steady operation. Loop regulators act as verniers in controlling generator voltages.

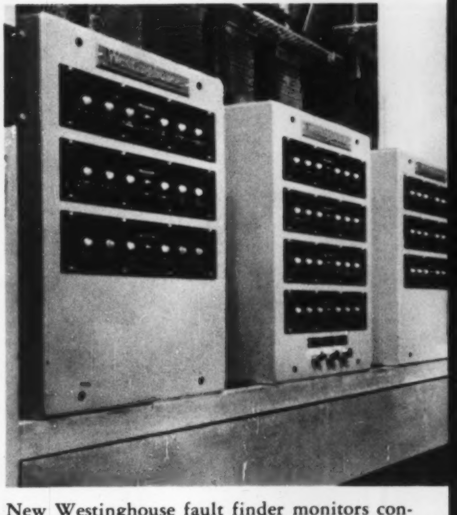
Magamp current regulator (CR) for booster and Magamp counter emf regulator (CEMFR) for motor work together to maintain regulated tension by the pay-off reels (POR) and winding reels (WR). Inertia compensation (IC), proportional to accelerating loads and stall tension signals, is introduced through the (CR) circuits.

Photo-thyratron loop regulators (LR) provide modulated control of storage loops for smooth operation.

Electronic regulators control top and bottom plating current to deposit proper tin coating on each side at all line speeds.

Machine characteristics are selected for optimum drive performance. Entry section pinch roll (PR), master bridle roll (MBR), and drag bridle No. 2 (DB-2), the pace setters of their respective line sections, are shunt-wound for flat speed-load characteristics. Tank drives (T) have high drooping characteristics which result in their developing only the power required to overcome their friction losses and inertia loads. Reel motors have overload capacities suitable for accelerating the large coils now used in most mills.

*Trade-Mark.

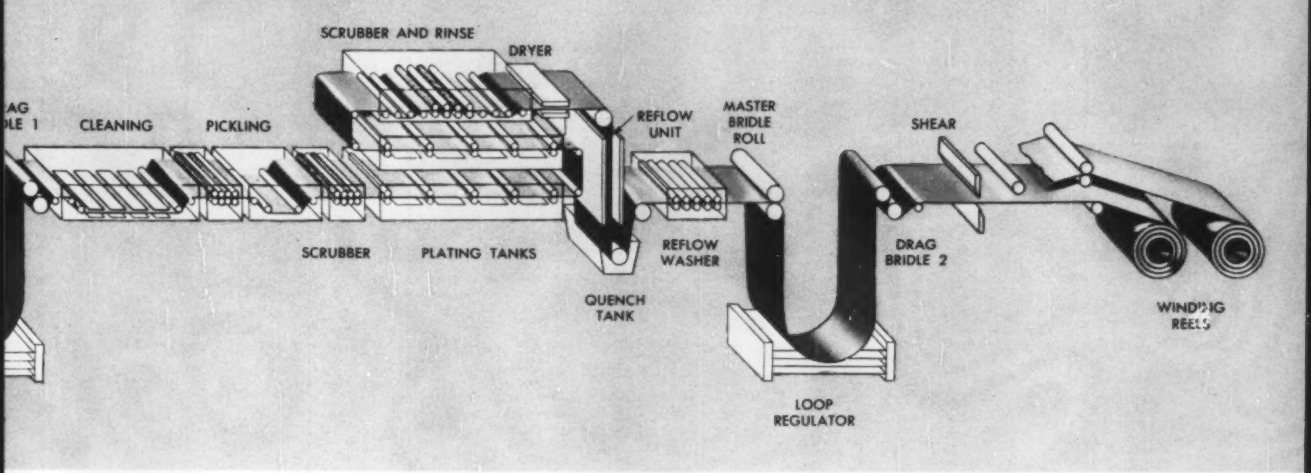


New Westinghouse fault finder monitors control circuits simultaneously, indicates system faults instantly . . . remembers them . . . makes trouble shooting easy.

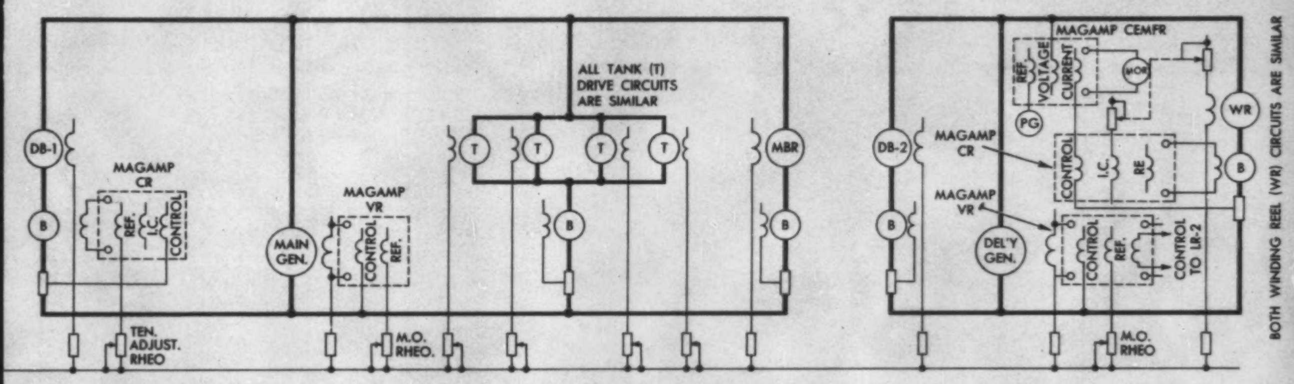
YOU CAN BE SURE...IF IT'S

Westinghouse

ELECTROLYTIC TINNING LINE

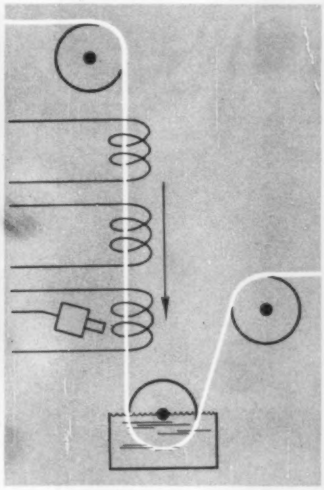


AG
LE 1
CLEANING
PICKLING
SCRUBBER AND RINSE
DRYER
REFLOW UNIT
MASTER BRIDLE ROLL
SHEAR
SCRUBBER
PLATING TANKS
QUENCH TANK
REFLOW WASHER
DRAG BRIDLE 2
WINDING REELS
LOOP REGULATOR
OR



DB-1
B
MAGAMP CR
REF.
I.C.
CONTROL
TEN. ADJUST. RHEO
MAIN GEN.
MAGAMP VR
CONTROL
REF.
M.O. RHEO.
ALL TANK (T) DRIVE CIRCUITS ARE SIMILAR
T
T
T
T
B
MBR
B
DB-2
B
MAGAMP CR
MAGAMP VR
DEL'Y GEN.
MAGAMP CEMFR
REF.
VOLTAGE
CURRENT
PG
MOR
WR
CONTROL
I.C.
RE
B
CONTROL
REF.
CONTROL TO LR-2
M.O. RHEO
BOTH WINDING REEL (WR) CIRCUITS ARE SIMILAR

Westinghouse 2400-kw oscillator equipment supplies high-frequency power to inductor coils. Generator output can be raised or reduced 90% in a couple of seconds.



Photoelectric scanner measures light reflection of passing strip, regulates radio-frequency power application in fraction of a second through saturable reactor.

WESTINGHOUSE EQUIPMENT SERVES THESE USERS

COMPANY	LOCATION	RATED LINE SPEED FPM	TIN FLOW EQUIPMENT
Jones & Laughlin Steel Corporation	Aliquippa, Pa.	600	600 kw, RF
Jones & Laughlin Steel Corporation	Aliquippa, Pa.	2100	1800 kw, RF
Republic Steel Corporation	Niles, Ohio	1000	1000 kw, RF
Republic Steel Corporation	Niles, Ohio	1400	1400 kw, RF
Steel Mill	California	1500	3000 kva, conduction†
Weirton Steel Company‡	Weirton, W. Va.	1300	1200 kw, RF
Weirton Steel Company	Weirton, W. Va.	1300	1200 kw, RF
Weirton Steel Company	Weirton, W. Va.	2100	2400 kw, RF
Weirton Steel Company	Weirton, W. Va.	2100	2400 kw, RF
Youngstown Sheet & Tube Company	Indiana Harbor, Ind.	600	600 kw, RF
Youngstown Sheet & Tube Company	Indiana Harbor, Ind.	2100	2400 kw, RF†

†Not yet in operation. ‡Division of National Steel Corporation.

Several other electrolytic tinning lines have Westinghouse conduction or radio-frequency reflow heating equipment, but line drives of another manufacture.

Westinghouse d-c motors withstand tough treatment because Bondite* and Bondar* insulations have twice the life expectancy of ordinary insulation. This means longer service from drive system, as well as the motors. *Trade-Mark

World's fastest tinning lines are Westinghouse-equipped

Engineering for electrolytic tinning lines is the most demanding in a steel plant, and Westinghouse pioneering in this field dates back to early attempts to deposit tin electrolytically on steel strip. Westinghouse has supplied all the electric line drive and tin reflow equipment for the higher speed horizontal acid type lines, and is now building equipment for the highest speed, vertical acid type.

The fastest tinning lines have as many as 150 individual d-c motor drives. Combining these drives, the generators that supply power to them, the 12 to 15 operators' stations, and the 100-foot-long controller into a coordinated drive system requires the kind of engineering and manufacturing talent Westinghouse can give you.

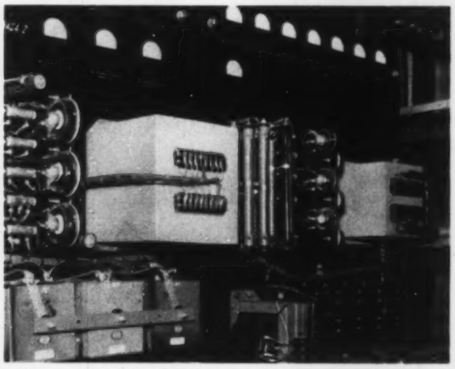
Reflow equipment, electro-cleaning and chemical treatment generators, switchgear, and numerous individual a-c motor drives and controls for pumps, scrubbers, welders and machinery adjustments must also be integrated into the system.

From planning to design, installation and start-up . . . Westinghouse brings decades of experience to you. A Westinghouse team will accept unit responsibility, and work with your engineering staff and consulting engineers in setting up your tinning line.

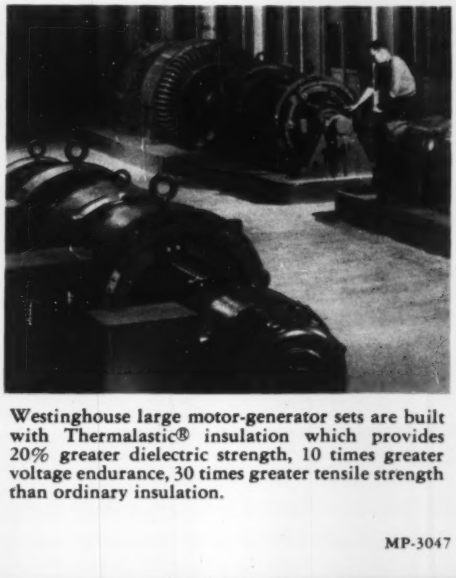
Contact your Westinghouse sales office for further details. Ask for a copy of B-6072, *Westinghouse Drives for Processing Lines.* Or write, Westinghouse Electric Corporation, 3 Gateway Center, P.O. Box 868, Pittsburgh 30, Pennsylvania.

YOU CAN BE SURE...IF IT'S

Westinghouse



Magamp regulators have no moving parts, brushes, commutators, bearings . . . bring outstanding precision, dependability to line drive control.

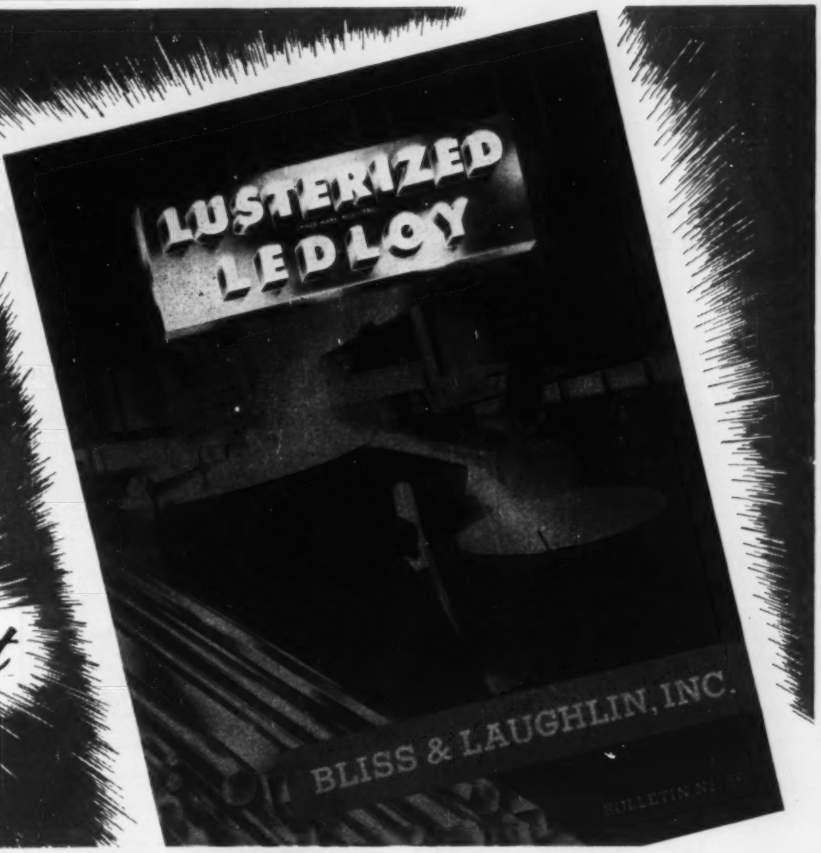


Westinghouse large motor-generator sets are built with Thermalastic® insulation which provides 20% greater dielectric strength, 10 times greater voltage endurance, 30 times greater tensile strength than ordinary insulation.

MP-3047

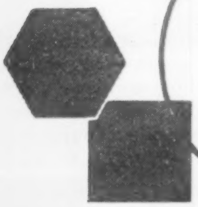
SEND FOR YOUR COPY—

Facts you'll want to know about . . .



Today's HIGH PRODUCTIVITY Machining Steel

BLISS & LAUGHLIN'S
LUSTERIZED LEDLOY



SMOOTH
BRIGHTER
CLEANER
FASTER

Every user and maker of screw steel parts should check into the production possibilities of LUSTERIZED† Ledloy* Cold Drawn Bar Steels.

When you use LUSTERIZED Ledloy, you get the ultimate performance for which modern automatics are designed.

In addition, you obtain a superior surface on all areas of the finished part.

Ask for our New BULLETIN No. 56
Copies now available on request

Write to: Bliss & Laughlin, Inc.
281 E. 155th St., Dept. 52
Harvey, Illinois

† Patent Applied for Bliss & Laughlin, Inc.
* Registered Trade-Mark Inland Steel Company.

BLISS & LAUGHLIN, INC.

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(Advertisement)

An Important Message to Foundry Executives

Competition and the Seven

The *Law of Diminishing Returns* is becoming a curse in foundries of all types. Chief cause is the greatly accelerated rate of obsolescence in molding machines . . . and *time* is the key factor.

Seven years is a *relative* increment of time. Its significance varies with the subject concerned. A child of seven is only a youngster, still fourteen years short of maturity. A dog is pushing the averages at seven. And a foundry molding machine that is seven years old or older . . . no matter how well it has been maintained . . . is *economically* obsolete.

Other types of machinery still are in their prime at age seven. Why is the molding machine an exception? The answer is simple. Its environment as well as its function are unfavorable to longevity.

The abrasive action of sand is an accepted evil in molding operations. Every foundry has experienced profit-cutting "replacement costs", even with the best equipment. What many foundry executives overlook, however, is the fact that *replacement parts do not make a new machine.* They can bring a machine back to its *own* standard, but they cannot compensate for new production techniques or for basic improvements in molding machine design.

Admittedly, it is cheaper . . . in the short run . . . to replace parts than to purchase new machines. But what are the long-range aspects of this practice? If rebuilt equipment cannot match a competitor's new equipment in capacity or economy of operation, how can a foundry using old machines meet competitive price and delivery schedules and still show a reasonable profit? This is not a rhetorical question. It keeps many foundry executives awake nights.

KEEPING "OLD FAITHFUL" IN OPERATION CAN COST YOU YOUR SHIRT . . . AND PROFIT.

ARE YOU "CRYING A RIVER" OVER OPERATING AND MAINTENANCE COSTS?

Another cost-consuming factor with old machines is "Down-time" . . . the irreplaceable loss of production capacity. The older a machine is, the more maintenance it requires, the greater the periodic down-time. *Unfortunately, "overhead costs" never stop for replacement.*

Consider your foundry's situation for a moment. Can you meet or beat your major competitors' price, quality and delivery? If you can, you are most fortunate. But . . . let's suppose you *are* at a competitive disadvantage. How long can you stay in that position and survive?

In industry, as in war, there are "the quick" and "the dead". The former keep pace with industry trends and changes . . . know when and how to improve operations and maintain their favorable position. These aggressive men also follow the policy of continual investment in new equipment.

The "dead" try to stand still in a moving current. They practice short-range economies and philosophies. And eventually they drown in the steadily rising river of competition.

The foundry economy is in a dramatic state of flux. A major factor is the growth of *automation* . . . a science with exciting, almost magical, overtones but with an extremely practical foundation. Automation is the large company's answer to shrinking profits as well as to greater production capacity of uniform standard. It is not, however, economically feasible for the majority

Concerning . . .

Year Curse

of jobbing or production foundries. In most cases, automated operations involve a far-greater-than-average capital expenditure.

This message is directed therefore to foundrymen who want to achieve greater efficiency and profits at relatively low cost. The answer here also is simple. *Invest in new high-speed semi-automatic equipment.* Relegate your seven year old molding machines to odd jobs. Or put them on the used machinery market. (There still are many who cannot see the "wolf at the door".)

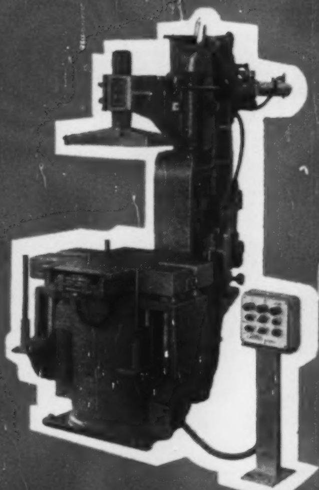
Once you have made this decision, select your new molding equipment carefully. But remember that old buying habits, like old machines, can cost you more in the long run.

EFFICIENT NEW EQUIPMENT GIVES YOU A COMPETITIVE ADVANTAGE IN PRICE, QUALITY, DELIVERY.

Your best bet is to select equipment made by the manufacturer who leads the industry in Creative Engineering . . . SPO Incorporated. Technological innovations developed by this company since World War II have had a profound effect on the foundry industry.

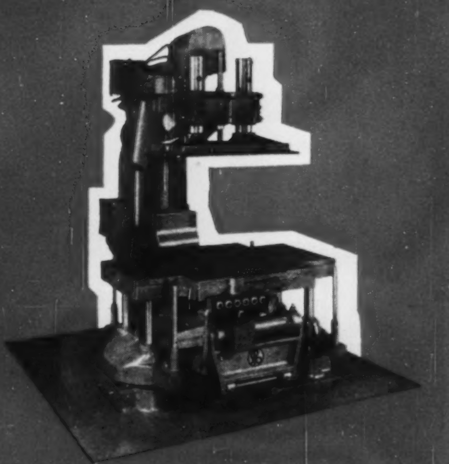
SPO "firsts" include development of the maintenance-free inverted jolt mechanism . . . the fully automatic SPOMATIC molding system and its components . . . the first practical hollow core machine . . . the self-aligning stripping mechanism . . . and the first successful application of green sand cores.

These accomplishments have established SPO as the leader in molding machine and ancillary equipment development. That is why SPO has become the world's largest supplier of molding machines, offering a complete range of types and sizes. **SPO INCORPORATED,** 6494 Grand Division Avenue, Cleveland 25, Ohio



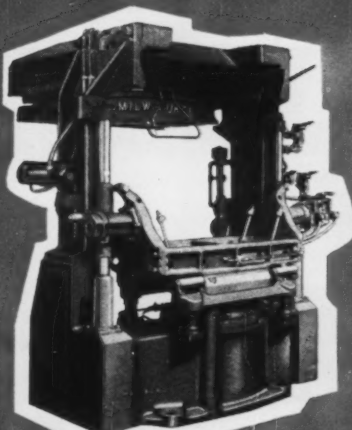
MODEL 2160-C

Series 2000-C *jolt-squeeze-strip/draw* machines feature automatic controls and simplified pushbutton operation. Available with squeeze cylinder diameters of 13, 14 and 16 inches.



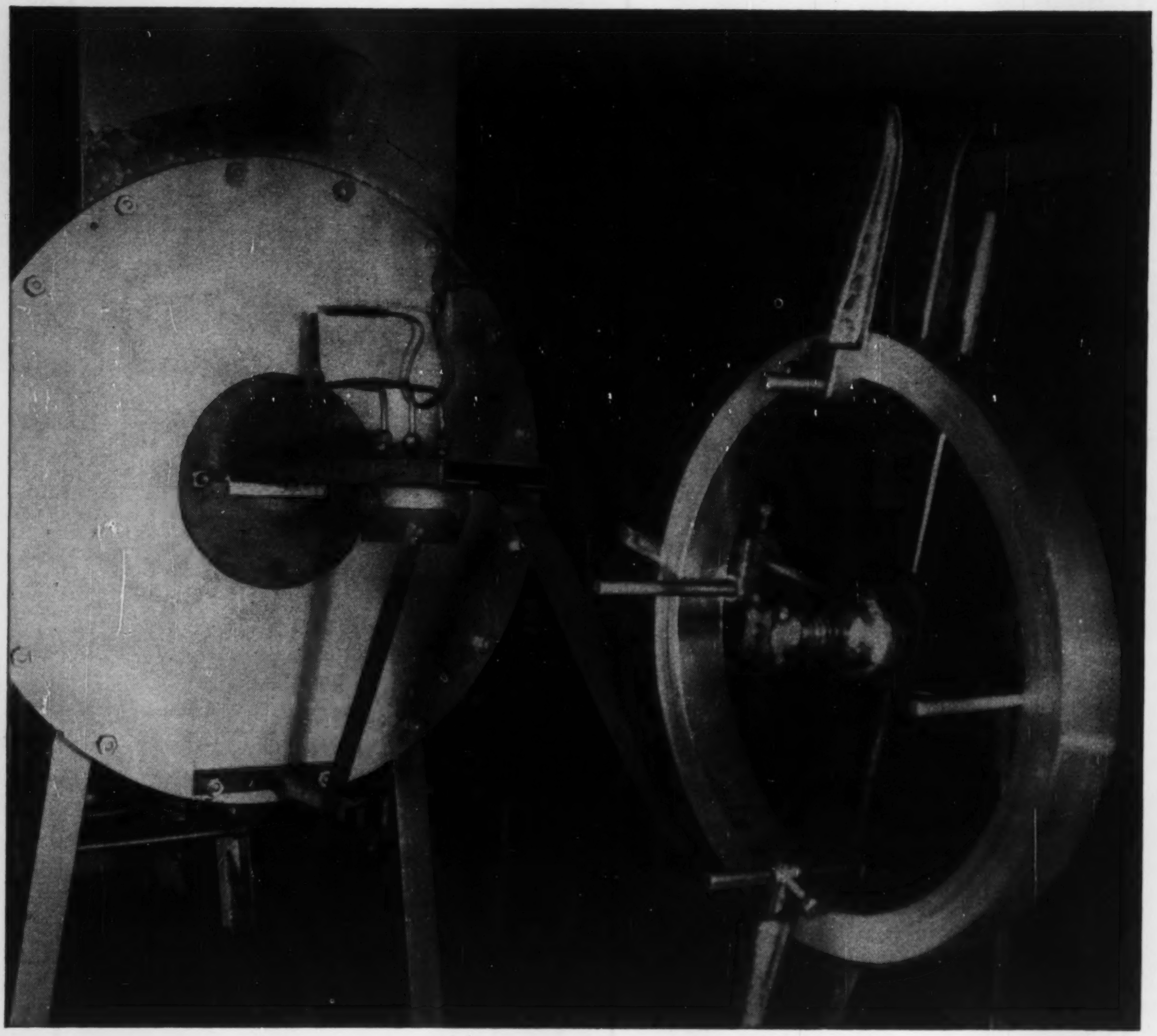
MODEL 2224

Featuring patented "inverted jolt" mechanism, this semi-automatic Series 2000 *jolt-squeeze-strip* machine handles wide range of flask sizes. Seven models available with jolt capacities from 1500 to 4000 pounds.



MODEL 217

This SPO-MILWAUKEE *jolt-squeeze-rollover-draw* machine combines all operations in simplest possible cycle for fast production of drag molds. Three models available (16, 21 and 30-inch squeeze pistons).

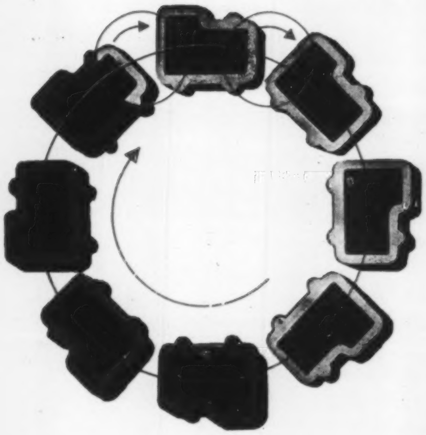


GAS heat-treats metal parts in your precision Hamilton watch

Gas is used by the Hamilton Watch Company to heat-treat metal parts of its watches—down to the tiniest balance staffs. Gas-fired strip furnaces maintain a temperature of 2,000 degrees to temper the strip used in processing hairsprings and mainsprings of all Hamiltons. The hairspring of a watch is finer than a human hair—yet, due to modern metallurgy and heat-treating methods, this delicate piece of steel may last a lifetime.

Gas is used in heat-treating processes at Hamilton because it is clean, economical, and permits exact temperature control. Throughout industry Gas and modern Gas equipment provide the most satisfactory method of heat processing. For information on how Gas can help you in your production operations, call your Gas Company's industrial specialist. He'll be glad to discuss with you the economies and outstanding results you always get with Gas and modern Gas industrial equipment. *American Gas Association.*

Here is the FASTEST KNOWN METHOD of milling the flat surfaces of repetitive pieces

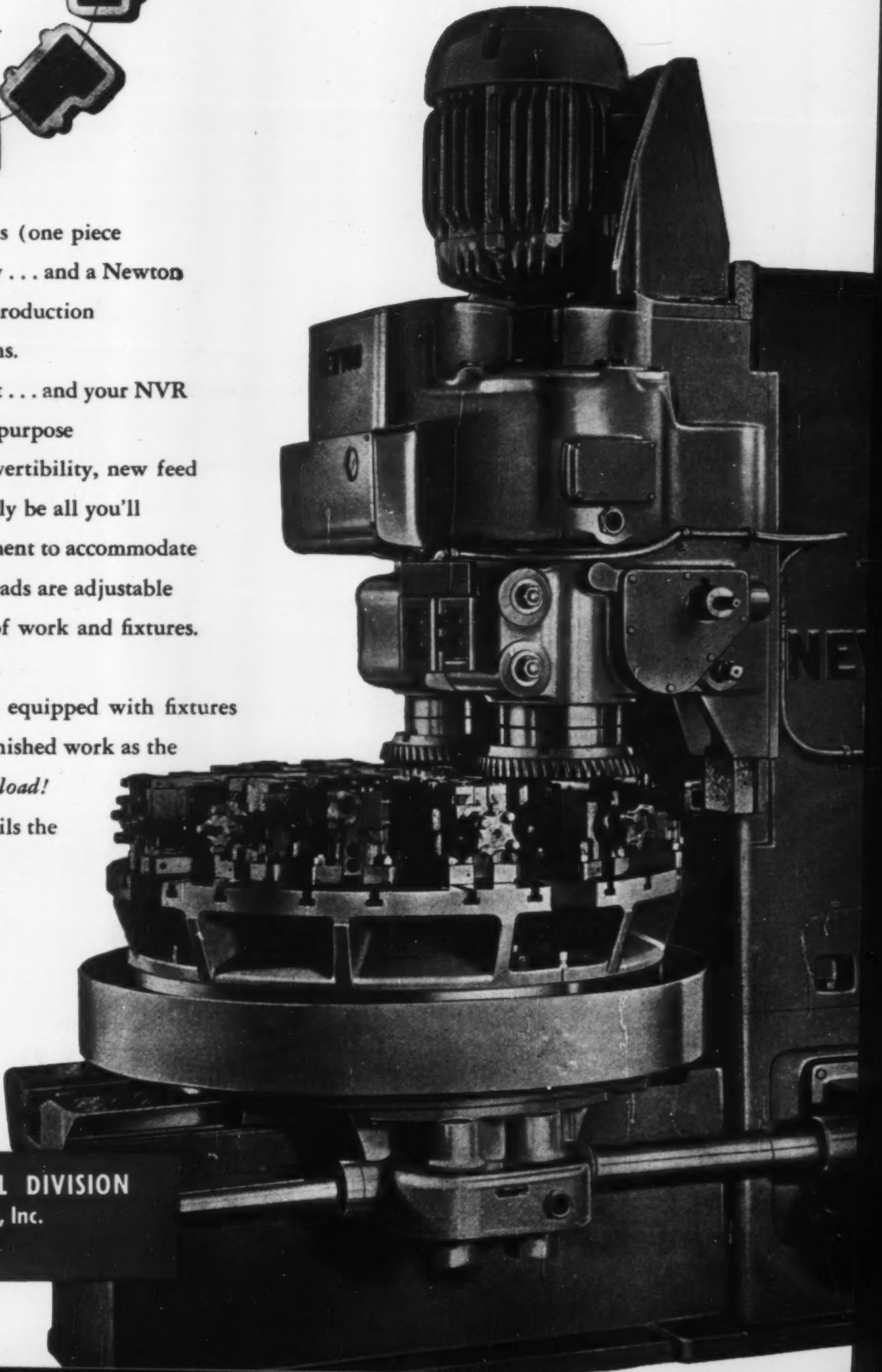


Mount your fixtures on base plates (one piece or sectional) for quick changeability . . . and a Newton Vertical Rotary will give you mass production economy on comparatively short runs.

Change the design of your product . . . and your NVR won't land in the morgue of single-purpose machine tools. Thanks to high convertibility, new feed and speed pick-off gears will probably be all you'll need. Tables have in-and-out adjustment to accommodate cut-circles of different diameters. Heads are adjustable up and down for different heights of work and fixtures. Spindles are individually adjustable.

Newton Vertical Rotaries can be equipped with fixtures that clamp, unclamp and eject the finished work as the table turns. *All the operator does is load!*

Write for bulletin 651, which details the advantages of these machines.



F/B

CONSOLIDATED MACHINE TOOL DIVISION
Farrel-Birmingham Company, Inc.
ROCHESTER 10, N. Y.

this 140-TON horizontal milling machine

also bores and turns

There's never been one like it before!

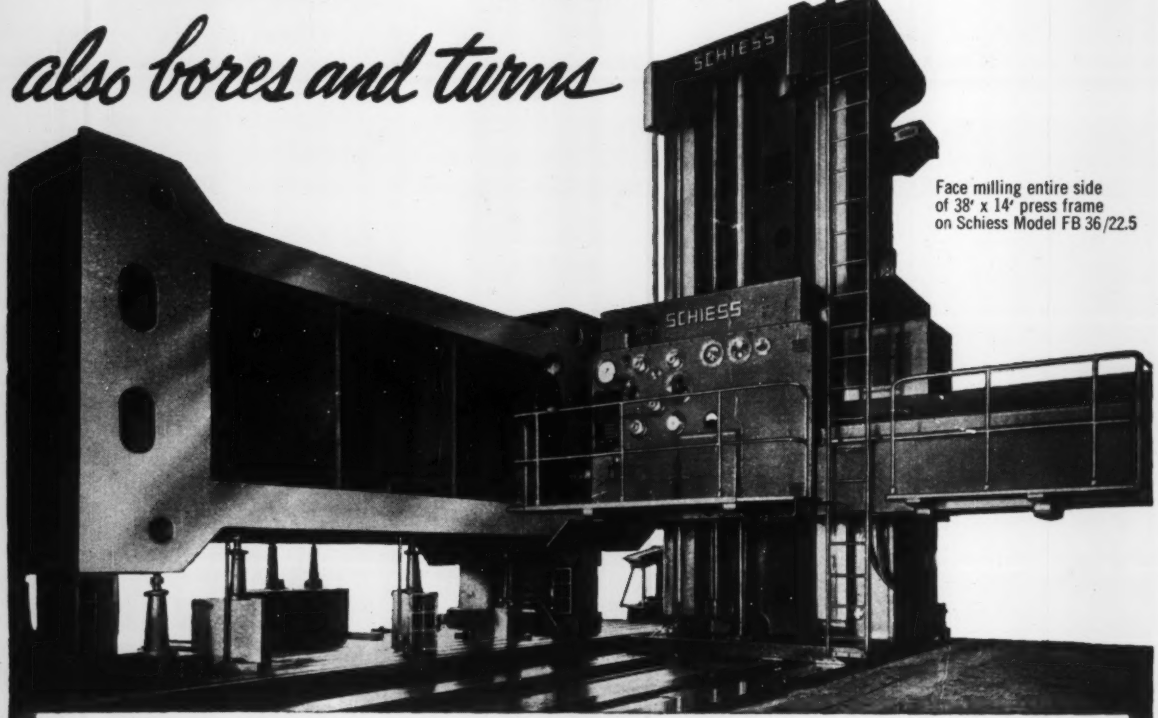
Just a press of a button puts this mighty Schiess into action. A 25-ft. high column moves smoothly along 45-ft. long bedways. Never a vibration—no chatter—even at maximum transversal loads! The new Schiess design of the spindle heads has eliminated this!

THE MILLING OPERATION. A huge tungsten-carbide cutter in a 14¼″ spindle goes to work on the stock. And performs its operation with a consistent accuracy—a surface-finish count—never before obtainable on such a big fellow.

THE BORING OPERATION. Another press of a button! Another spindle goes to work—bores a 79″ depth in one cut—or a total depth of 118″. Boring and milling spindles are provided with 36 speeds of which the top 12 are V-belt transmitted. Rapid traverse, feeds and manual controls of the two spindles are completely independent.

That this mighty machine has tremendous productive capacity is self-evident. And its productivity goes far beyond conventional milling and boring. Schiess attachments increase its scope to taper-milling, thread-cutting, copying and, in certain instances, copying in 3 dimensions. It's a time saver, too. Can go from feed to rapid traverse immediately, without complicated adjustments.

The Schiess Model FB 36/22.5 Horizontal Milling and Boring Machine is a product of Europe's largest builder of heavy machine tools. Parts and service are as close as Pittsburgh. An American Schiess Engineer will be happy to help you size up these heavy producers for your heavy production needs. Write for catalogs and complete specifications on all five FB models.



Face milling entire side of 38′ x 14′ press frame on Schiess Model FB 36/22.5

SCHIESS

engineering division

AMERICAN SCHIESS CORPORATION

1232 Penn Avenue, Pittsburgh 22, Pa.

Change motors in minutes—
with FALK all-steel
MOTOREDUCERS
FALK
FALK
OUT COMES OLD MOTOR ⬆
IN GOES REPLACEMENT MOTOR ➡

No long and costly "down time" involved

Motors can be interchanged or replaced *in minutes* with the all-steel, All-Motor type FALK Motoreducer. No long and costly "down time" is involved in making the change!

Best of all, replacement is not limited to original make of motor—new NEMA frames may be substituted for old. This versatile Motoreducer operates with any make, speed or type of standard foot-mounted motor within its AGMA rating. No modification, no special shaft, no "partial" motor required.

In addition to unmatched motor interchangeability, this dependable gear drive—the "work horse of industry"—offers: widest choice of output-shaft position (horizontal, vertical, right-angle)...any output-shaft connection...any mounting, including wall and ceiling...standard speed range from 1.5 rpm to 1430 rpm. All these advantages, plus proved efficiency, low maintenance and extra-long life, make the All-Motor type FALK Motoreducer your best buy for any job requirement.

Furnished in sizes up to 75 hp with any make, style or type of motor; or, *without a motor if desired.* FALK Motoreducers are available from convenient factory, field or distributor stocks, from coast to coast.

Write for Bulletin 3100

THE FALK CORPORATION, MILWAUKEE, WISCONSIN

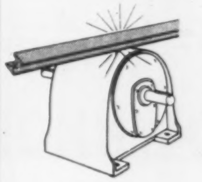
MANUFACTURERS OF:

- Motoreducers
- Speed Reducers
- Flexible Couplings
- Shaft Mounted Drives
- High Speed Drives
- Special Gear Drives
- Single Helical Gears
- Herringbone Gears
- Marine Drives
- Steel Castings
- Weldments
- Contract Machining

FALK

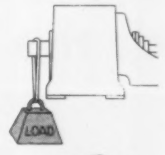
...a good name in industry

FALK "IN-BUILT" FACTORS assure full dependability—better service—longer life



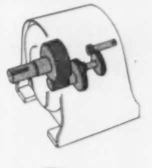
ALL-STEEL HOUSINGS

Rugged, strong, rigid ...all parts heavy steel plate, formed and welded in the Falk Weld Shop.



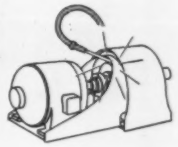
LARGE OVERHUNG LOAD CAPACITY

Large shafts, oversize bearings...rigid mountings with wide bearing spans to handle maximum loads.



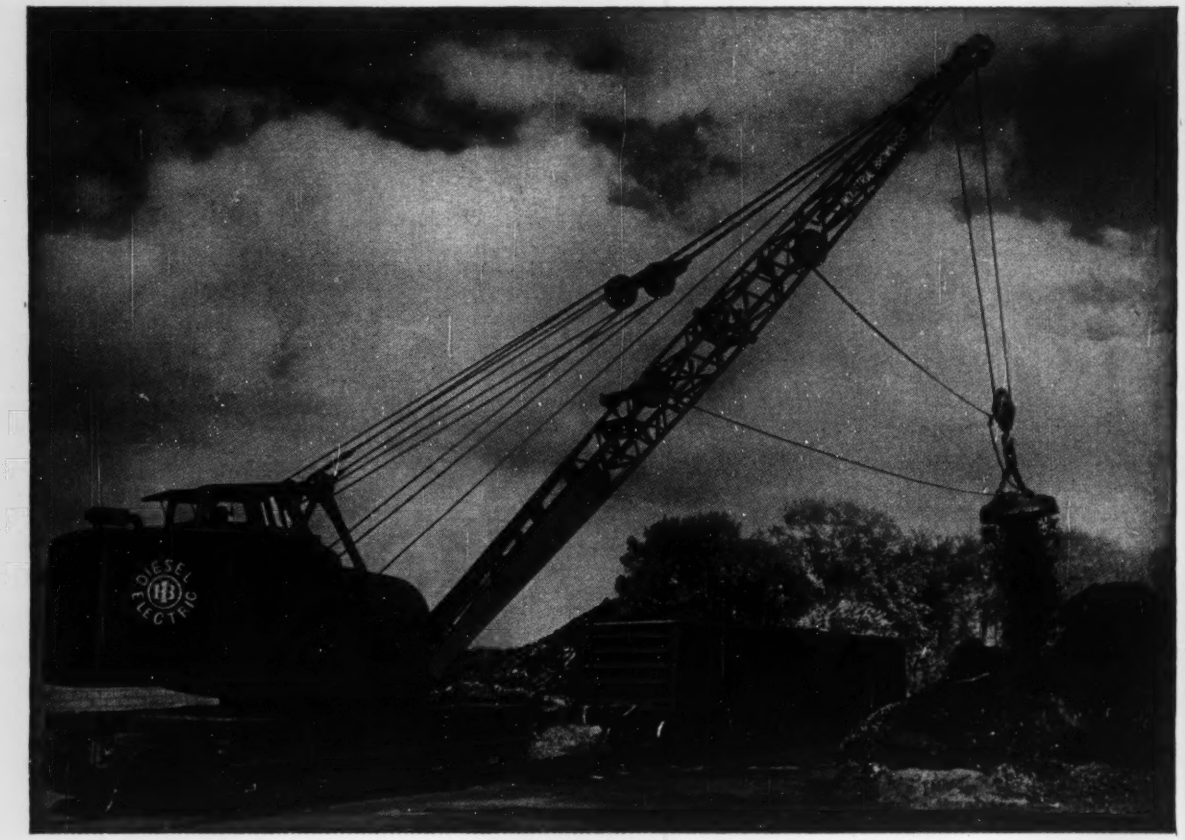
PRECISION GEARING

Heat-treated alloy steel gearing, precision cut and shaved after heat treatment to eliminate distortion.



SEALED HOUSINGS

Splashproof, dustproof, oiltight. Dual closures and one-way vents keep oil in, dust and moisture out.



With magnet hook or bucket... BROWNHOIST speeds the job

Brownhoist Cranes are helping maintain high production schedules in mines, steel mills, factories, and scrap yards . . . in fact, wherever there are railroads throughout the world. Brownhoist Diesel-Electric Locomotive-Cranes, for all their husky size, handle easily. Their patented Monitor Type Cab and Clear-Vision Boom give a 360° view. Operating controls are within easy reach. Electric travel permits operation as a switch engine as well as a crane. Constructed to last for many years with little maintenance. Brownhoist Diesel-Electric Cranes are available in capacities from 25 to 100 tons. For complete information, consult your nearest Brownhoist representative or write us today.

181

BROWNHOIST

BROWNHOIST MATERIALS
HANDLING EQUIPMENT
GIVES A LIFT TO
AMERICAN INDUSTRY

SUBSIDIARY OF Penn-Texas

INDUSTRIAL BROWNHOIST CORPORATION
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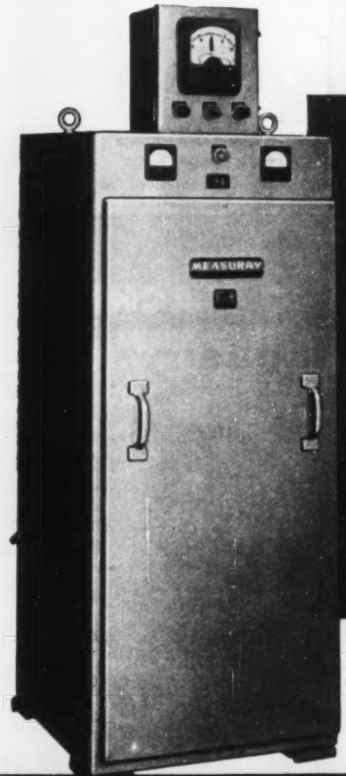
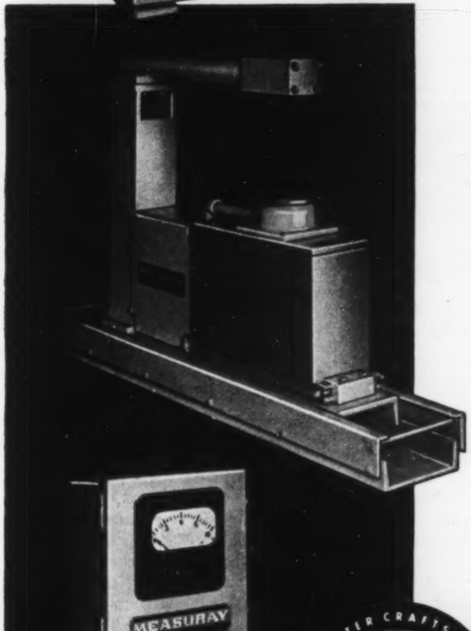


"MEASURAY"

MEASURES THICKNESS ACCURATELY without TOUCHING the MATERIAL



HOT or COLD STRIP STEEL • BRASS • COPPER • ALUMINUM • PLASTICS • FOILS • COATED FABRICS • FILM • RUBBER • Etc.,

Even when moving at High Speed

Simple method — the "Measuray" shoots X-Rays through the material — measures its absorption of the rays. Calibrated meter registers plus or minus per cent of deviation from pre-determined standard. Especially useful on hot mills where material can't be checked by contact gages. Also when material can be deformed by contact such as foil.

"Measuray" is accurate to 1% of thickness or less. Quickly pays for itself in reduced scrap.

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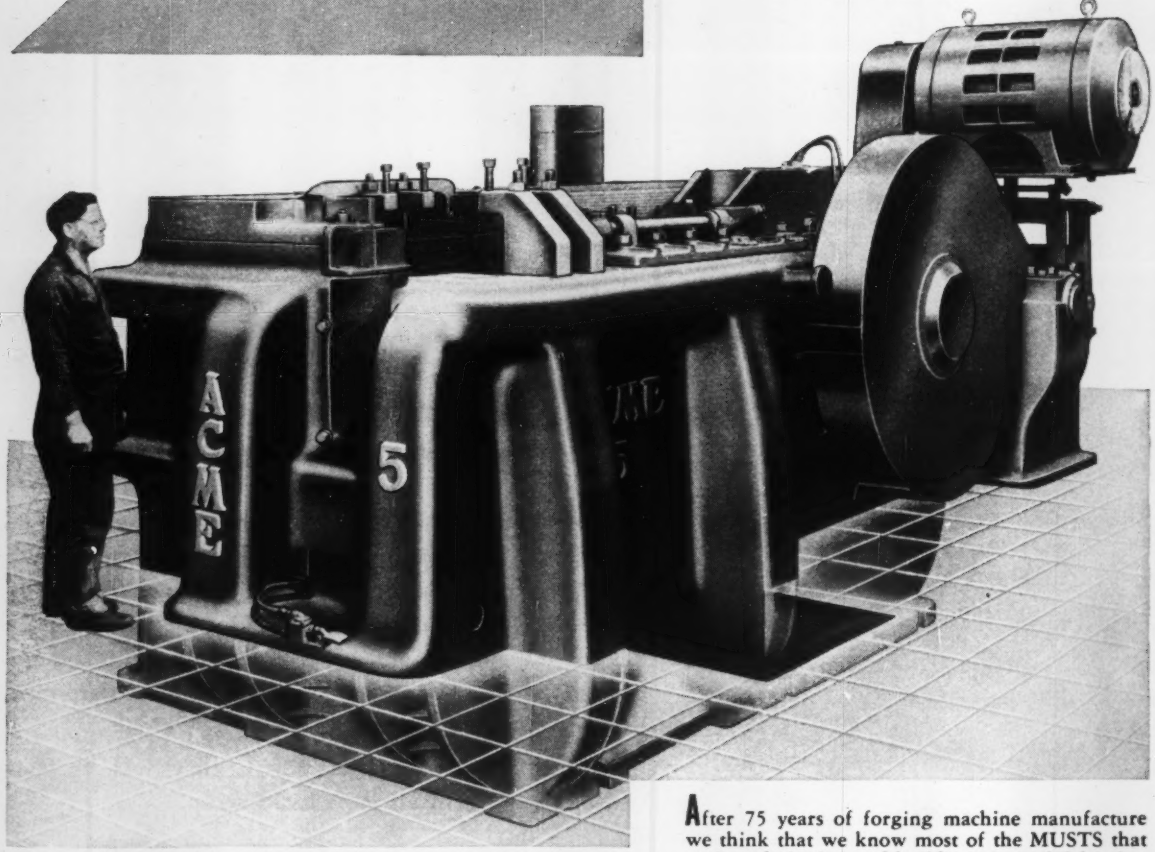
In forging machines–

TO GET PRECISION

YOU *MUST* HAVE WEIGHT!

...ACME XN FORGING MACHINES

are the HEAVIEST in the Industry



5" ACME XN

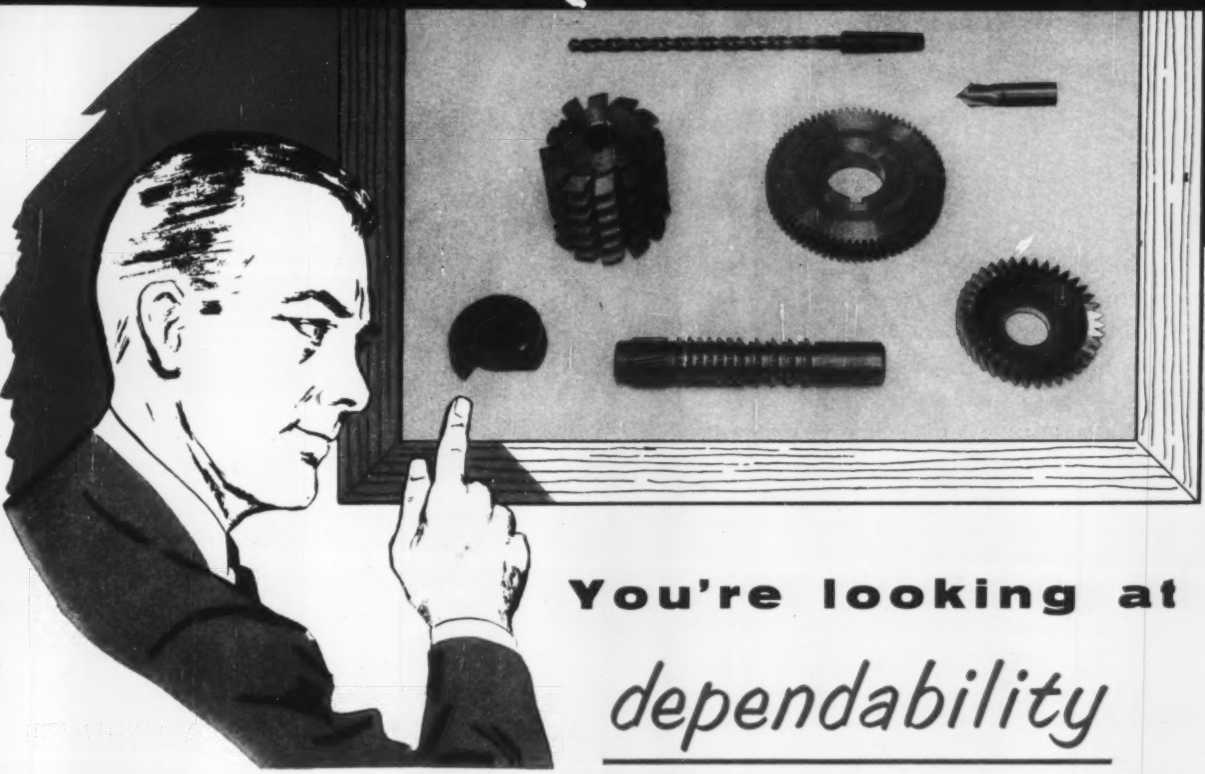
OVER 100 TONS of CONTROLLED PRECISION

After 75 years of forging machine manufacture we think that we know most of the MUSTS that go into designing and building successful forging machines. One of those MUSTS is WEIGHT. Only recently we have added still more strength in one or two spots on ACME XN Forging Machines where greater rigidity will insure still greater accuracy and long term trouble-free operation. If you do not have the latest facts on ACME XN Forging Machines we invite you to determine for yourself just what progress has been made in modern forging machine equipment. *Bulletin 956 tells the story.*

THE HILL ACME COMPANY

ACME MACHINERY DIVISION
ESTABLISHED 1882
1203 W. 65th St., Cleveland 2, Ohio

"ACME" FORGING • THREADING • TAPPING MACHINES • ALSO MANUFACTURERS OF "HILL" GRINDING & POLISHING MACHINES HYDRAULIC SURFACE GRINDERS • "CANTON" ALLIGATOR SHEARS BILLET SHEARS • "CLEVELAND" KNIVES • SHEAR BLADES



You're looking at *dependability*

Cutting tools made from quality high speed steel . . .

Stronger — Tougher
More Economical
Less Chipping

than
Carbide tools

On countless cutting applications, users consistently find tools made of quality high speed steels give more economical, dependable performance than carbide tools. The superior toughness of quality high speed steel gives greater cutting versatility . . . no need to "baby" the tool under variable chip load conditions. Also, with proper sharpening and honing (comparative to that given carbide tools) phenomenal performance can be obtained from high speed steel.

First in quality!

Latrobe's

XL® high speed steels

Latrobe's XL® high speed steels contain uniformly dispersed alloy sulphides for improved machinability and longer tool life. These alloy sulphides, together with the wear resistant carbide particles, are evenly distributed throughout the steel by Latrobe's exclusive DESEGATIZED® process of manufacture. This unique process assures full structural uniformity, higher edge strength and consistent response to heat treatment.

Use dependable tools . . . use high speed steel cutting tools.

Your nearest Latrobe representative will be pleased to give you complete data on Latrobe's XL® high speed steels.

LATROBE
STEEL COMPANY
Main Office and Plant: Latrobe, Pa.
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IN ADDITION TO
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BORON TRIFLUORIDE
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anhydrous . . . aqueous

Here are many more production-controlled, high-quality fluorides:

- Ammonium Bifluoride
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- Barium Fluoride
- Bismuth Fluoride
- Boron Trifluoride
- Boron Trifluoride Complexes
- Chromium Fluoride
- Copper Fluoborate
- Fluoboric Acid
- Fluorine Cells
- Fluorinating Agents
- Frosting Mixtures
- Hydrofluoric Acid Anhydrous
- Hydrofluoric Acid Aqueous
- Hydrofluosilicic Acid
- Lead Fluoborate
- Metallic Fluoborates
- Potassium Bifluoride
- Potassium Chromium Fluoride
- Potassium Fluoborate
- Potassium Fluoride
- Potassium Titanium Fluoride
- Silico Fluorides
- Sodium Fluoborate
- Tin Fluoborate
- Zinc Fluoborate
- Zinc Fluoride

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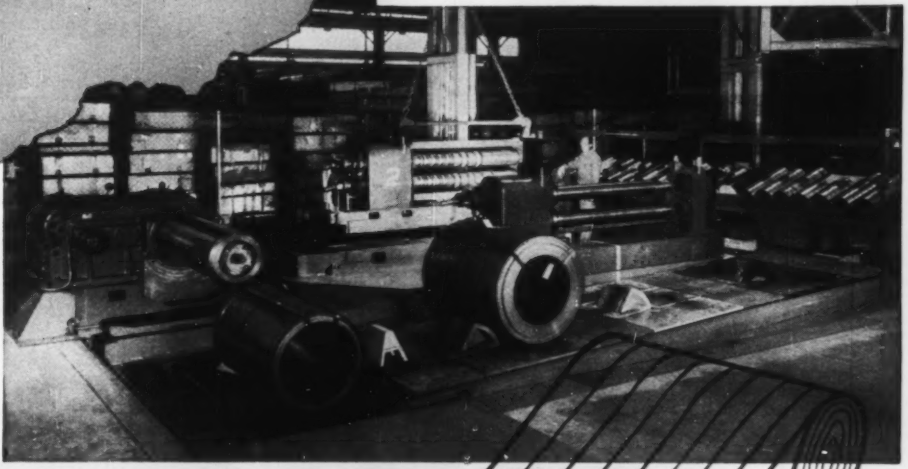
WRITE FOR

Harshaw's 40-page Book on Hydrofluoric Acid Anhydrous. It provides helpful data.

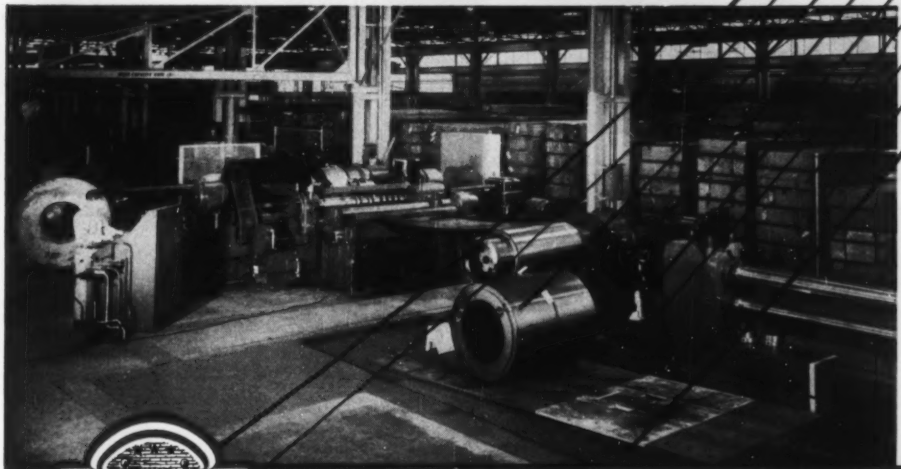
Step Up Production with Stamco Coiling Lines

Stamco Slitting and Coiling Lines will step up your production because they are designed to meet your particular specifications. Years of experience have led to the development of equipment that will meet every slitting and coiling requirement. Stamco slitting and coiling lines are now efficiently handling coils from 500 to 60,000 pounds and are designed to give dependable, maintenance-free service.

Write us, stating your requirements . . . we'll gladly give complete details—no obligation.



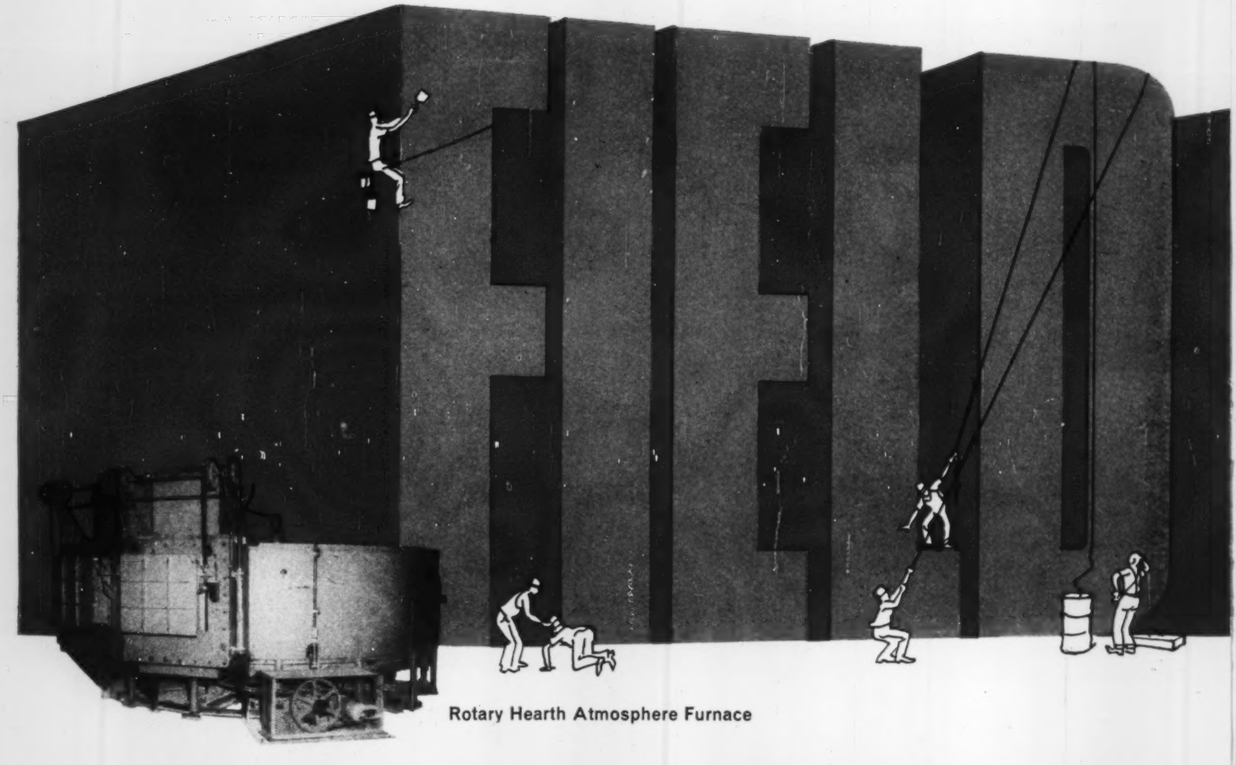
View shows coil and traverse, coil pay off reel, coil loading ramp and detachable slitter head.



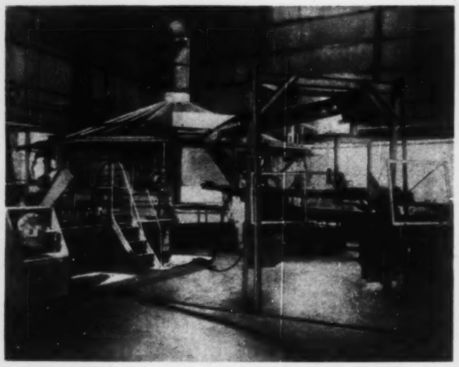
Overall view of coiling line from entrance end.

LAY YOUR SHEARING PROBLEMS AT STAMCO'S DOOR

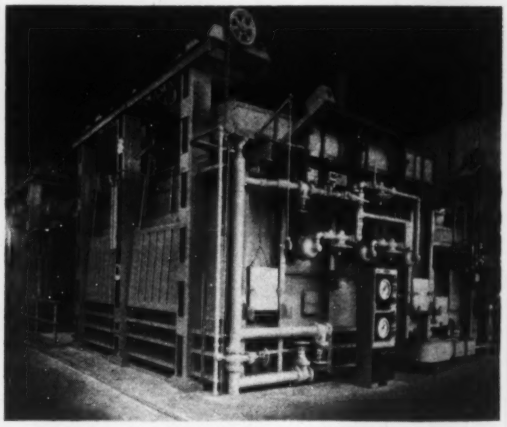
STAMCO, Inc., New Bremen, Ohio



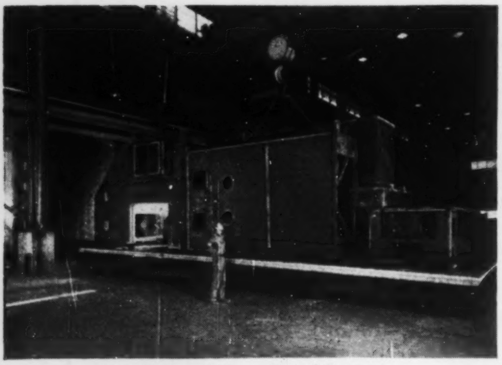
Rotary Hearth Atmosphere Furnace



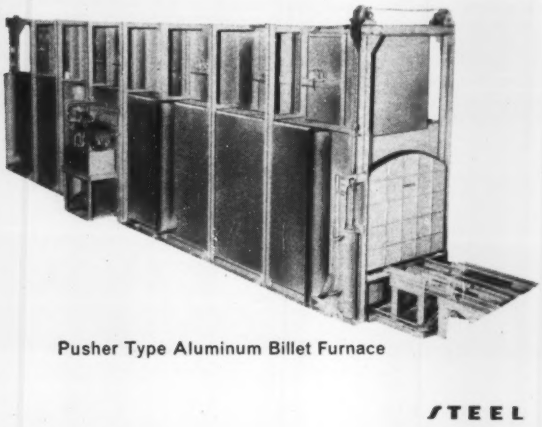
Rotary Hearth Forge Furnace



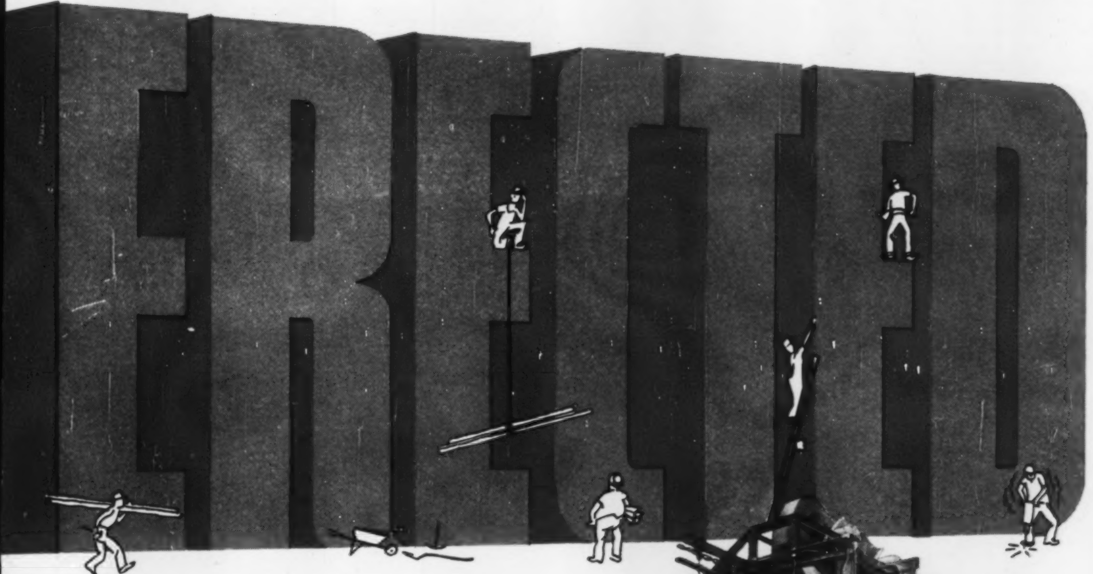
Aluminum Reverberatory Melting Furnace

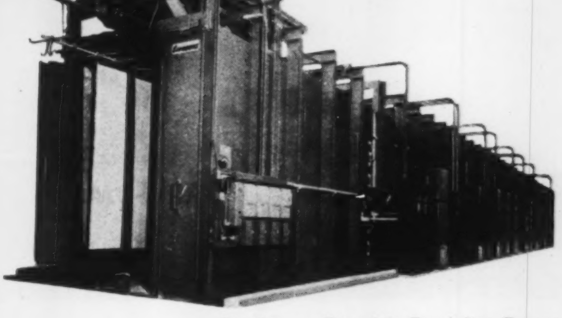


Car Bottom Stress-Relief Furnace

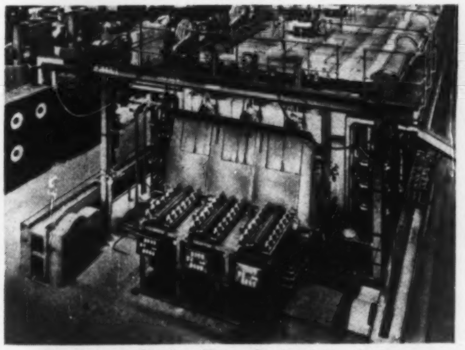


Pusher Type Aluminum Billet Furnace

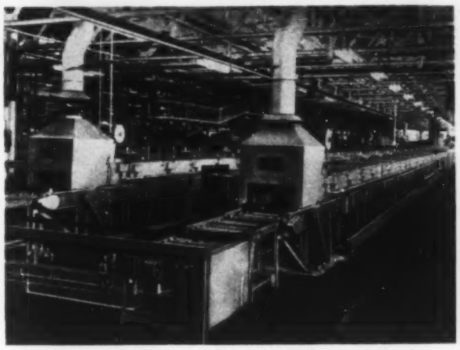




Continuous Porcelain Enameling Furnace



Three-row Pusher Type Carburizing Furnace



Roller Hearth Brazing Furnaces

Lindberg makes BIG ONES

Whatever your production needs, if it calls for any type of industrial heating or processing installation requiring field-erection in your own plant, better talk it over with Lindberg. Here are just a few of the large field-erected installations recently put up by Lindberg. More are being built right now.

You get a complete package deal from Lindberg. Expert engineers consult with you and analyze your needs. Then they plan and design an installation to meet your specific requirements, whether you need a single furnace or a complete production line. And Lindberg will build it for you, right in your own plant.

To get on-the-spot service from an expert Lindberg engineer, just call your nearest Lindberg Field Office (see the classified section of your phone book, or the Trade Directories).

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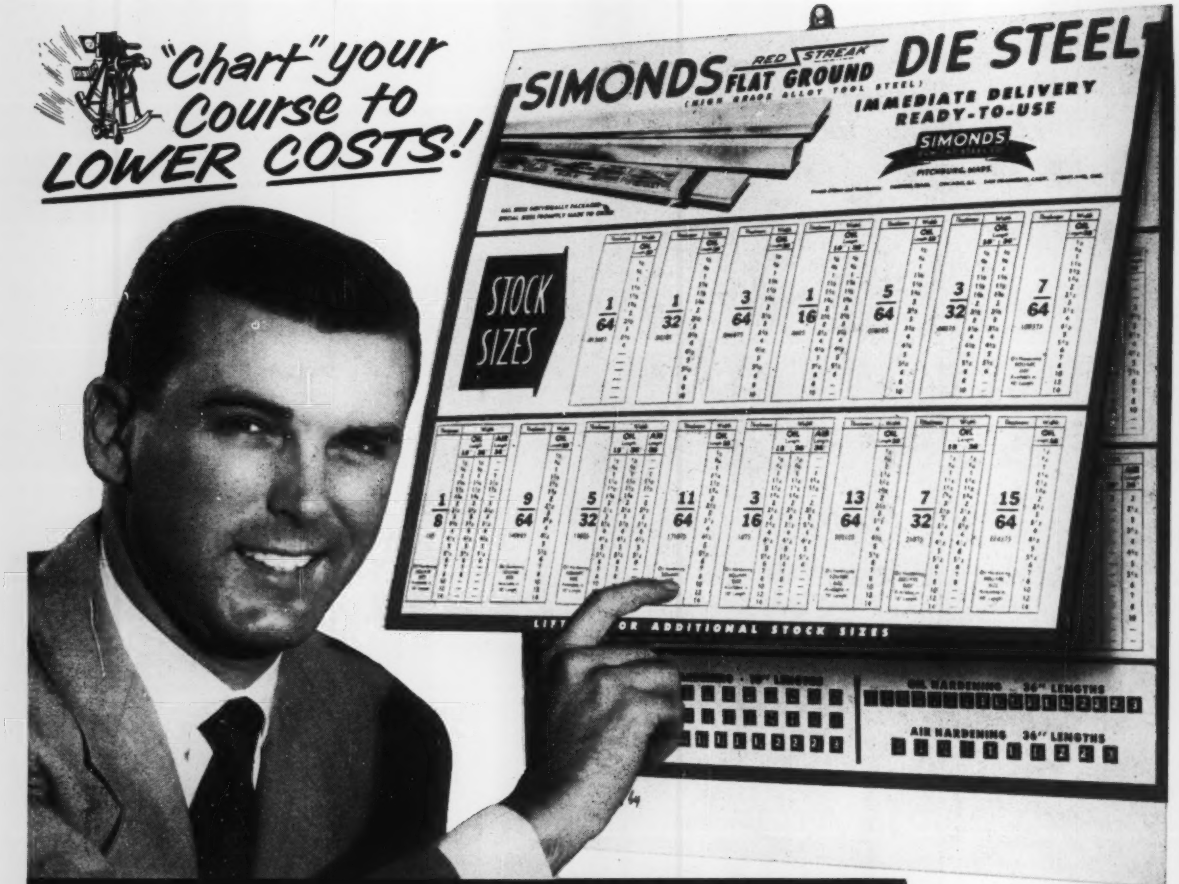
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SIMONDS RED STREAK FLAT GROUND DIE STEEL
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7/32
15/64
LIFT ... OR ADDITIONAL STOCK SIZES
OIL HARDENING 36" LENGTHS
AIR HARDENING 36" LENGTHS

Get your copy of Free Wall Chart showing MORE NEW STOCK SIZES of

SIMONDS

Flat Ground

DIE STEEL

(HIGH GRADE ALLOY TOOL STEEL)

Finding or selecting the right size bar of ready-to-use tool and die steel is a simple matter with this specially designed wall chart (19″ x 20″). At your fingertips it shows "1001 sizes for 1001 uses" — flats and squares — including hundreds of newly added sizes . . . all precision ground, packaged and on the shelf ready to save you time, cut your costs and give you consistently better results.

QUICK FACTS

Precision Ground, Ready-to-Use for making Punches, Dies, Jigs, Gages, Fixtures, Templates, Machine Parts, Small Tools and 1001 other uses

Made of High Grade Alloy Tool Steel from Simonds Own Mill

Wide Hardening Range Simplifies Heat-treating — Assures Consistently Excellent Results

Choice of OIL or AIR Hardening Types

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For Fast Service from Complete Stocks

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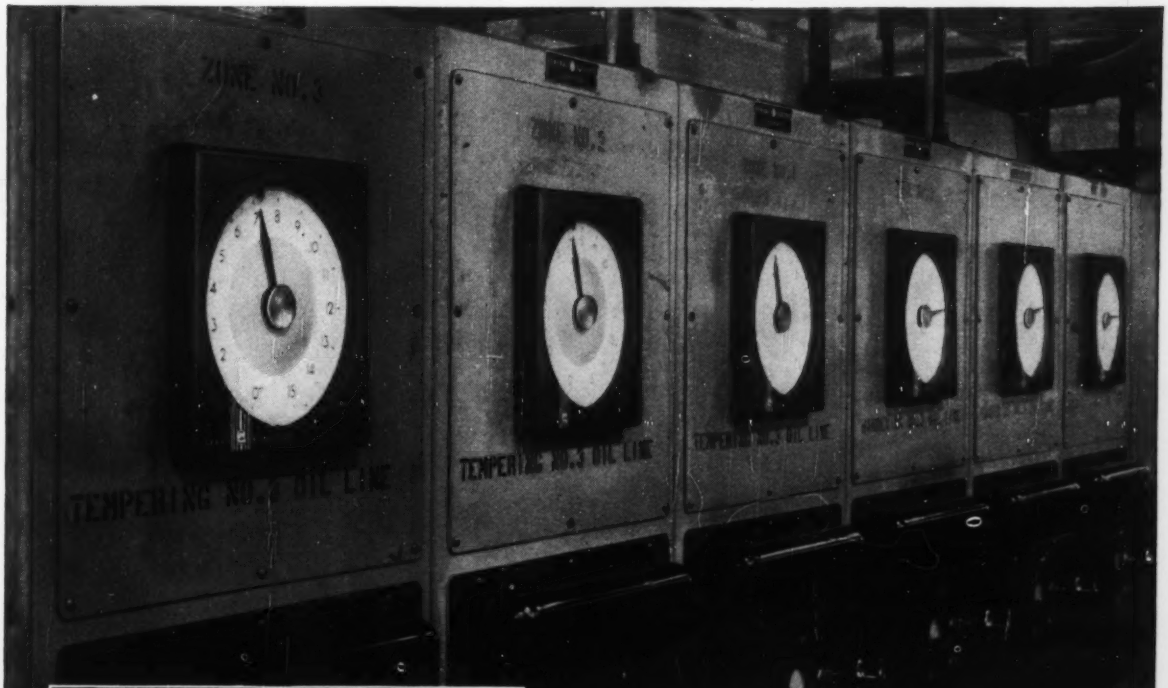


"On Temperature"

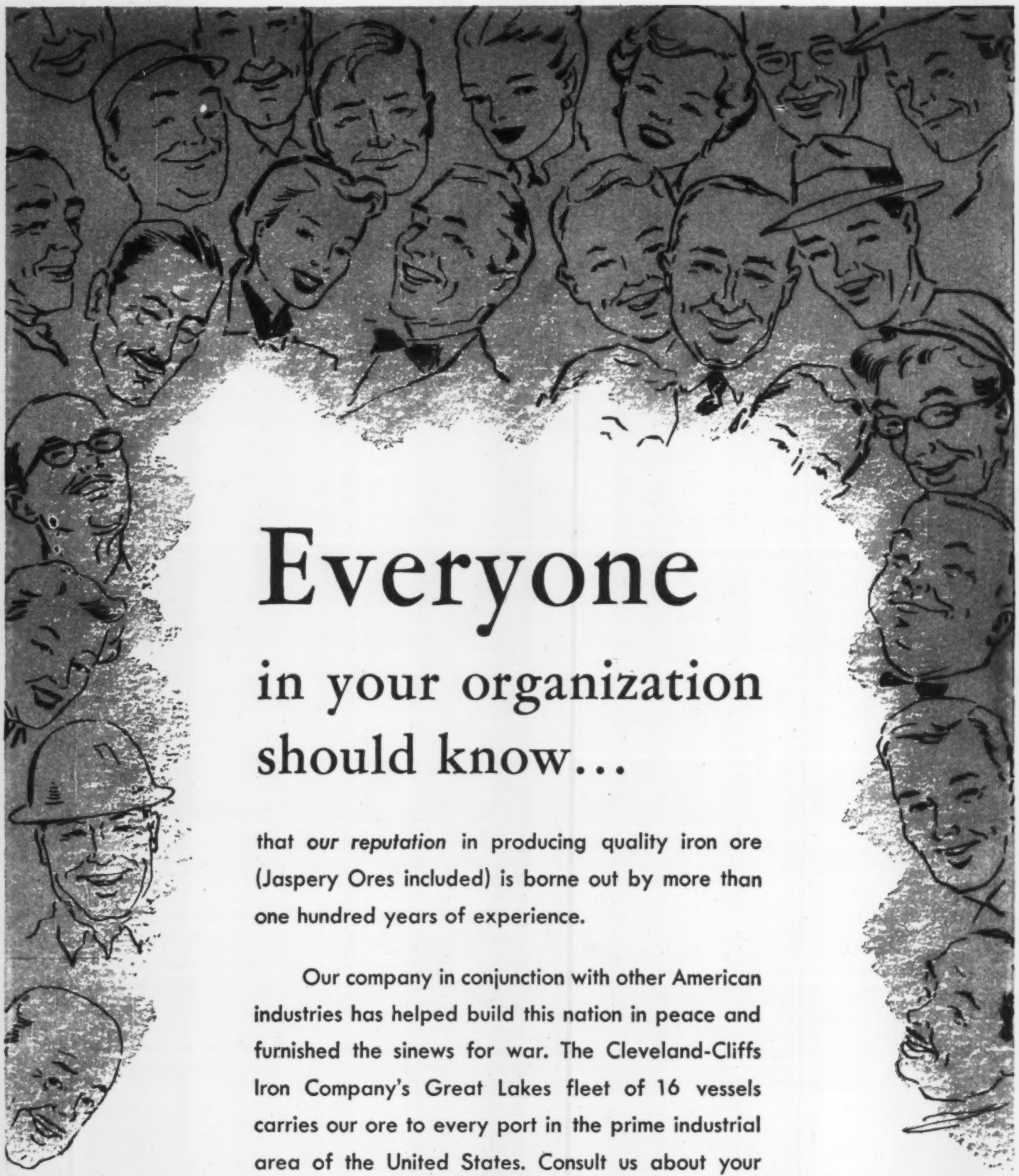
WITH SPEEDOMAX® H

▪ Once operators at The Cold Metal Products Co. set their Speedomax H indicating and recording controllers, they can forget about temperature and attend to other production matters. In the Company's Youngstown, Indianapolis and Los Angeles plants, these men *know* their processes are on temperature and a glance at their Speedomax H instruments confirms it: black indicating pointers line up with red control point indexes.

Longtime users of L&N equipment, Cold Metal Products takes such control for granted. To meet customer specs for flat rolled spring steel, close temperature control is a "must." And Speedomax H helps by holding temperature "on the nose" on their continuous hardening, tempering and annealing lines, and on their bell-type annealing furnaces. Such close temperature control helps produce the same results again and again, assuring high product quality.

To find out more about Speedomax H temperature control for your process, contact your nearest L&N office or write 4957 Stenton Ave., Philadelphia 44, Pa.

LEEDS LN NORTHRUP
Instruments Automatic Controls • Furnaces



Everyone

in your organization should know...

that *our reputation* in producing quality iron ore (Jaspery Ores included) is borne out by more than one hundred years of experience.

Our company in conjunction with other American industries has helped build this nation in peace and furnished the sinews for war. The Cleveland-Cliffs Iron Company's Great Lakes fleet of 16 vessels carries our ore to every port in the prime industrial area of the United States. Consult us about your Ferro Alloys and Coal Needs.

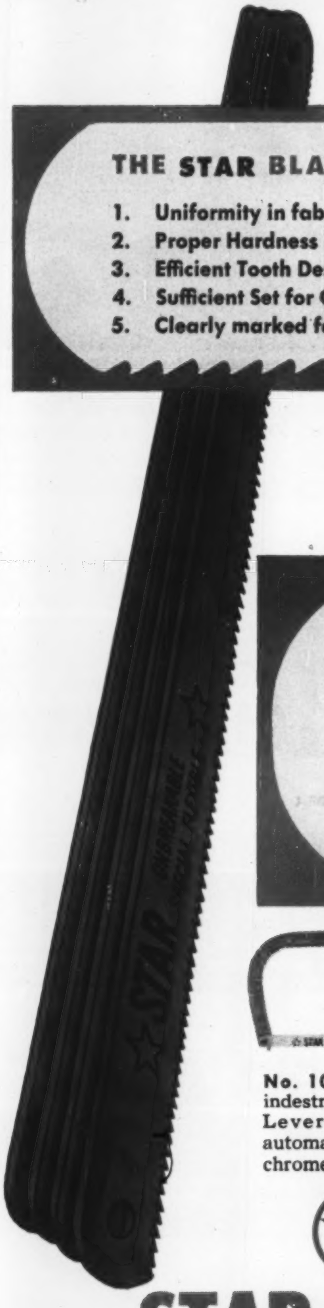
IRON ORE ★ ALLOYS ★ VESSEL TRANSPORTATION ★ COAL

The Cleveland-Cliffs Iron Company

UNION COMMERCE BUILDING • CLEVELAND 14, OHIO

TO MEET AND BEAT HIGH PRODUCTION COSTS

compare the blades you're using with STAR



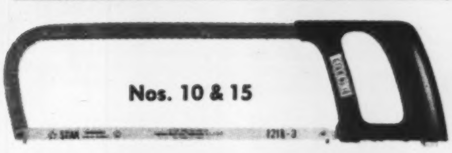
THE STAR BLADES GIVE ALL 5

1. Uniformity in fabrication
2. Proper Hardness
3. Efficient Tooth Design
4. Sufficient Set for Clearance
5. Clearly marked for Ease of Identification

Point 1 OF STAR'S 5 FEATURE CHECKLIST

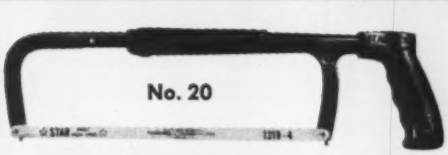
UNIFORMITY IN FABRICATION

All saw blades are made by a step-by-step process. But the finished blade will be perfect *only* if each preceding step is perfect. Star Blades are uniformly perfect because every step in the Star manufacturing process is done on super-accurate *automatic* machines—under the supervision of highly skilled operators.



Nos. 10 & 15

No. 10—Green molded handle. Almost indestructible. Shaped for comfort. Patented Lever-Lock positions, tensions blades automatically. **No. 15** — Red molded handle, chrome-plate finish. Same features as No. 10.



No. 20

Long a favorite with mechanics, this gunmetal finish adjustable pistol-grip frame with lever for lock blade features extra easy blade change.

STAR BLADES

Manufactured by

CLEMSON BROS., Inc., Middletown, N. Y., U. S. A.

Makers of Hand and Power Hacksaw Blades, Frames, Metal and Wood Cutting Band Saw Blades and Clemson Lawn Machines

Star
WALL CHART

Clemson Bros., Inc.
Middletown, N.Y., U.S.A.

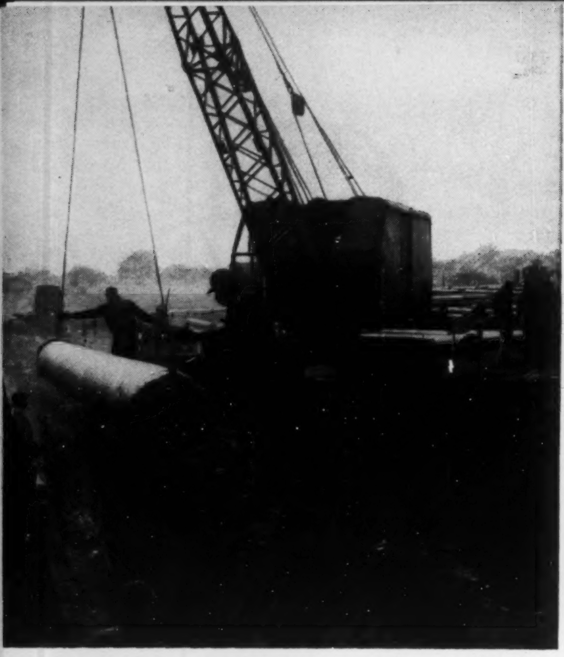
☐ Please send the STAR Metal Cutting Guide that contains information on blade types, cutting techniques, feeds and speeds and general metal cutting information.

☐ Please send the STAR Metal Cutting Chart—A handy guide for the shop metal worker.

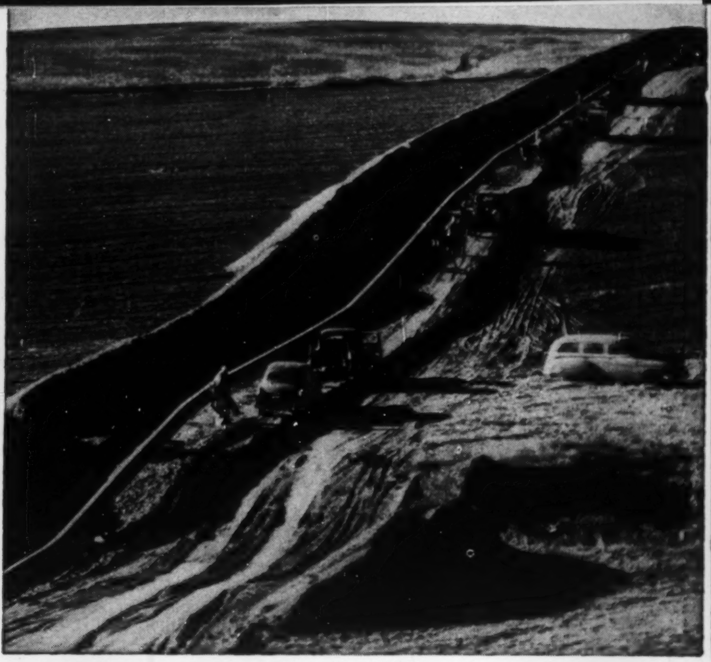
Name____________________________

Address____________________________

City______________Zone____State______ 3540

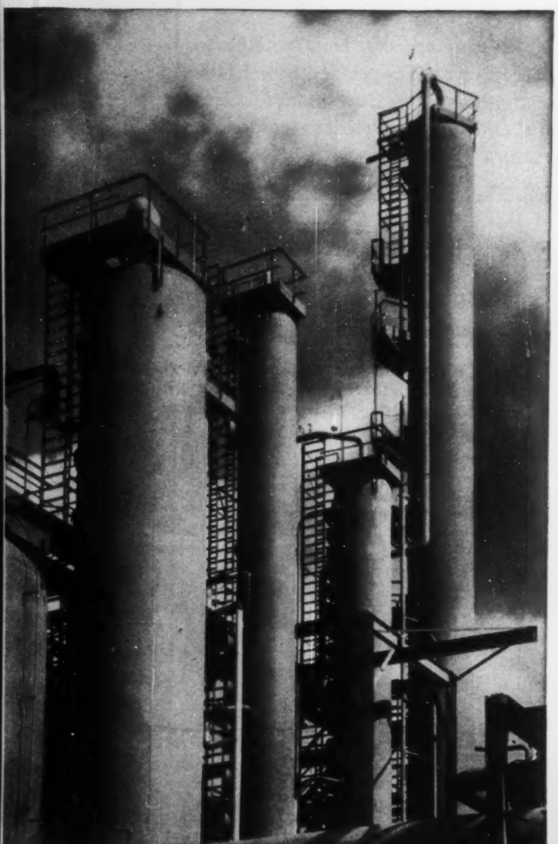


NATIONAL SEAMLESS STEEL BOTTLES go underground to store gas the modern way. Safe from all surface hazards, each 39-foot, 3-inch bottle, 24 inches in diameter, will hold 25,000 cu. ft. of gas at 2,240 p. s. i. Before shipment, each bottle is subjected to a high pressure hydrostatic test, assuring the ultimate user safe, long-time service.



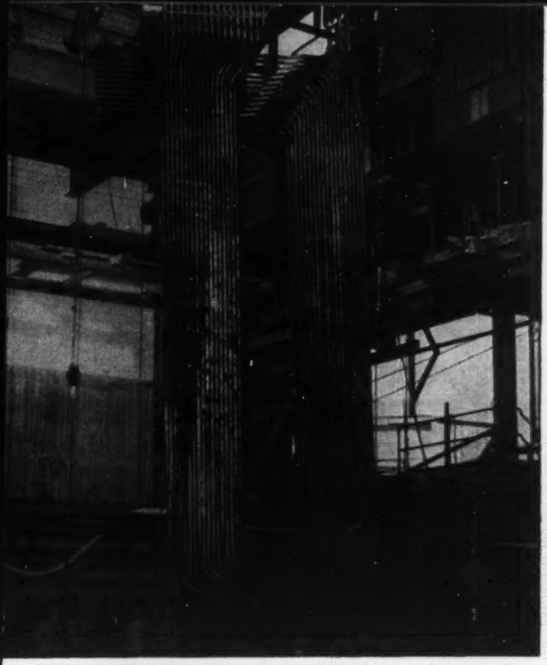
IN THIS 625-MILE PIPELINE, from Wyoming to Missouri, are 45,000 tons of National Seamless Pipe, in sizes of 20, 22, and 24 inches O.D. Service Pipe Line Company laid the line to bring crude oil from the Rocky Mountains to midwest refining centers. Outlet capacity of the line can reach 245,000 barrels per day.

REFINERIES RELY ON 2 DOZEN DIFFERENT ANALYSES made available by National Tube—each designed to handle specific refinery conditions such as corrosion, oxidation, high and low temperatures, and pressures. Other chemical compositions are also available in tubular products, and a wide variety of high temperature problems are now under study.



BACKBONE OF A NATIONAL

THE NATIONAL SEAMLESS METHOD of manufacture is one of the most difficult forging operations in the steel industry. A billet of the finest steel is actually pierced to produce a seamless tube with absolutely uniform wall strength. No welds . . . no joints . . . no weaknesses.



SUPERHEATER COILS BEING POSITIONED for use in one of today's modern giant superheaters. Here, steam at more than 2000 psi is superheated to 1000 F. Severe as this duty is, it poses no problem for National Seamless.

THE 100-TON B-47 STRATOJET has a heavy-duty landing gear, consisting of dual main wheels in tandem which support the fuselage, and single outriggers attached to the inboard engine pods. The outer cylinder of each of these rugged outrigger struts is fabricated from cold drawn tubes of National's Shelby Seamless Mechanical Tubing.

HUNDRED INDUSTRIES...

Seamless Pipe and Tubes

When a giant B-47 Stratojet lands "hard," the undercarriage must absorb a tremendous shock. And when boiler tubes are installed in a modern power plant, they've got to stand up for a long time, under terrific pressures and temperatures. In such applications, where high strength, complete dependability, and long life are so very crucial, you'll always find USS NATIONAL Seamless Pipe and Tubes.

NATIONAL Seamless combines to the highest degree such vital qualities as strength, safety and workability. Uniform throughout and dimensionally accurate, NATIONAL Seamless Pipe and Tubes promise smooth installation and long satisfactory service. Available in a complete range of steel analyses, wall thicknesses and diameters, every foot is produced to exacting standards by the world's largest manufacturer of tubular steel products.

Bring your pipe and tubing problems to National Tube. Regardless of the application, our engineers are interested in discussing the problem with you.

NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

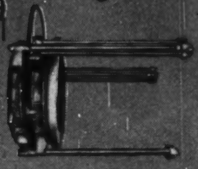
SEE The United States Steel Hour. It's a full-hour TV program presented every other week by United States Steel. Consult your local newspaper for time and station.

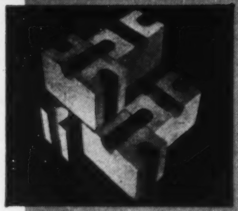
USS **National Seamless Pipe and Tubes** WALLS WITHOUT WELDS

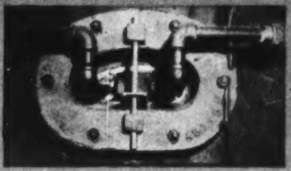
UNITED STATES STEEL

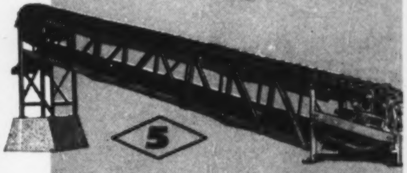
These Jobs are done more efficiently

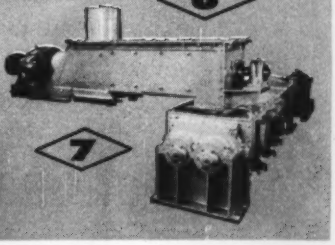
WITH Bailey EQUIPMENT









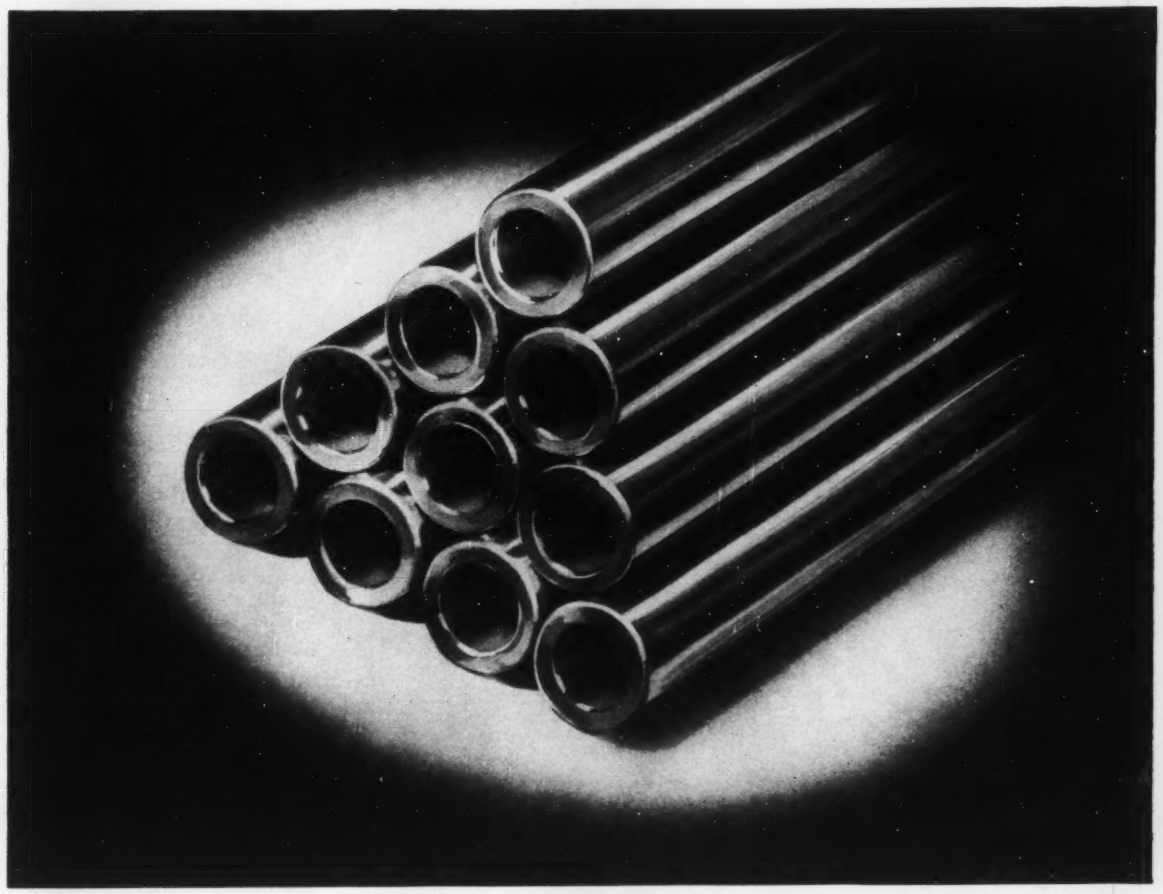


1. **For Controlling Gas Mains . . .** Bailey Goggle Valves in thermal expansion (36″ to 120″ diameters) and mechanical (6″ to 72″ diameters) types.
2. **For Plugging Tapping Holes . . .** Bailey Clay Guns provide plenty of power and clay capacity for maintaining long holes.
3. **For Blast Furnace Stoves . . .** Bailey services include design, construction and relining — using Kennedy Checkers with cross-flue feature.
4. **For Cooling Blast Furnace Linings . . .** Bailey Cooling Plate Holder provides a gas- and water-tight seal, with ease of removal for inspection or replacement.
5. **For Pig Casting . . .** Bailey Pig Casting Machines provide trouble-free service while increasing casting capacity for foundries and blast furnaces.
6. **For Stopping Cinder Notches . . .** Bailey Cinder Notch Stoppers eliminate hazards to workmen at the cinder notch.
7. **For Sintering . . .** Bailey Pug Mills assure efficient pugging or mixing for blast furnace dust catchers and sintering plants. Feeder illustrated for Dust Catcher Mill maintains an even flow of the material to be processed.

Other Bailey Products: Blast Furnace Cold Blast Valve • Blast Furnace Blow-Off Valve • Check and Snort Valve • Mixing and Check Relief Valve • Fabricated Steel Stove Bottom • Precision Table Feeder • Ladle Skulling Hook

WILLIAM M. Bailey COMPANY
ENGINEERS
LEADERSHIP THROUGH QUALITY

1221 BANKSVILLE ROAD
PITTSBURGH 16, PA



Typical Bishop Tubing

Look No Further...For QUALITY

Bishop small diameter stainless steel tubing is not surpassed in meeting corrosion, heat, shock, stress and vibration.

It is not excelled in quality of starting stock . . . in accuracy of I.D. and O.D. . . . in dimensional precision . . . in finish.

When quality is of prime importance for hydraulic lines, for aircraft parts, for instruments, for electronics . . . in fact wherever high quality steel tubing is indicated, look to Bishop for the finest . . . at comparable prices.

Platinum and Platinum Group Metals
Stainless Steel Tubing
Tubular Fabricated Parts
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CAPILLARY, MECHANICAL, HYPODERMIC & AIRCRAFT

Stainless Steel Tubing—seamless and welded and drawn
(.008" to 1.000" O.D.)

Nickel and Nickel Alloy Tubing
(up to .625" O.D.)

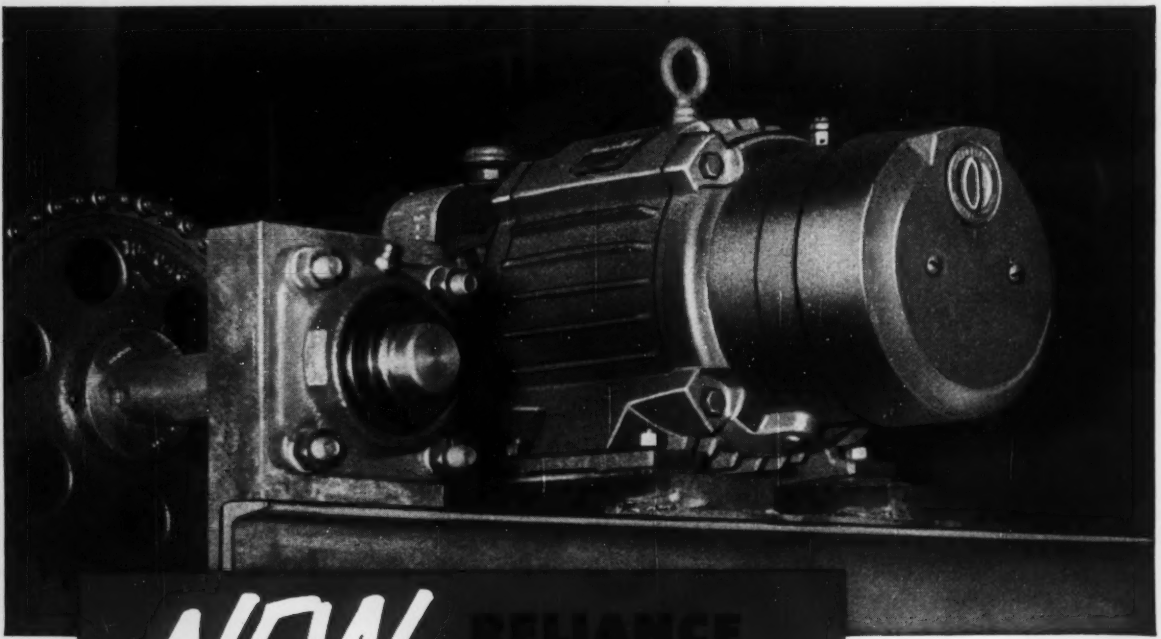
Bent, Flanged, Flared,
Milled, Slotted, Swaged, Threaded, etc.

Illustrated Catalog and
Prompt Quotations on request

STAINLESS STEEL PRODUCTS DIVISION

J. BISHOP & CO. Platinum Works

Malvern, Pennsylvania



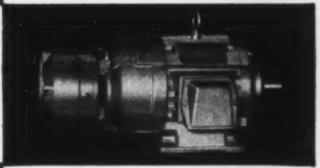
NEW RELIANCE BRAKEMOTOR

These new motors are specifically designed for tough operating conditions. Corrosion-proof cast-iron housings and sealed joints make this motor impregnable to foreign material.

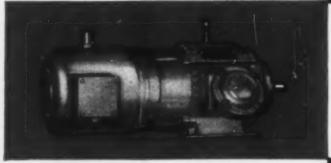
Braking torque ratings from 3 ft. lbs. thru 345 ft. lbs. Fail-safe mechanism immediately applies brake in case of power failure. One piece molded brake linings provide fast, smooth stops and unmatched holding power for heavy loads.

Simple brake has only six parts and requires no control wiring or auxiliary electrical equipment. Compact construction requires a minimum of space. Wearing parts are easily accessible for fast maintenance.

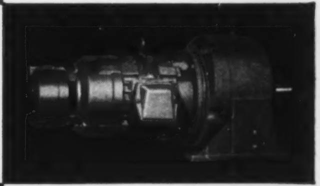
For further information write for bulletin B-2503. B-1533



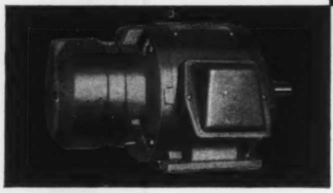
Totally-Enclosed, Corrosion-Proof



Explosion-Proof—Cl. I, Gr. D and Cl. II, Grs. E, F & G



Corrosion-Proof Gearmotor



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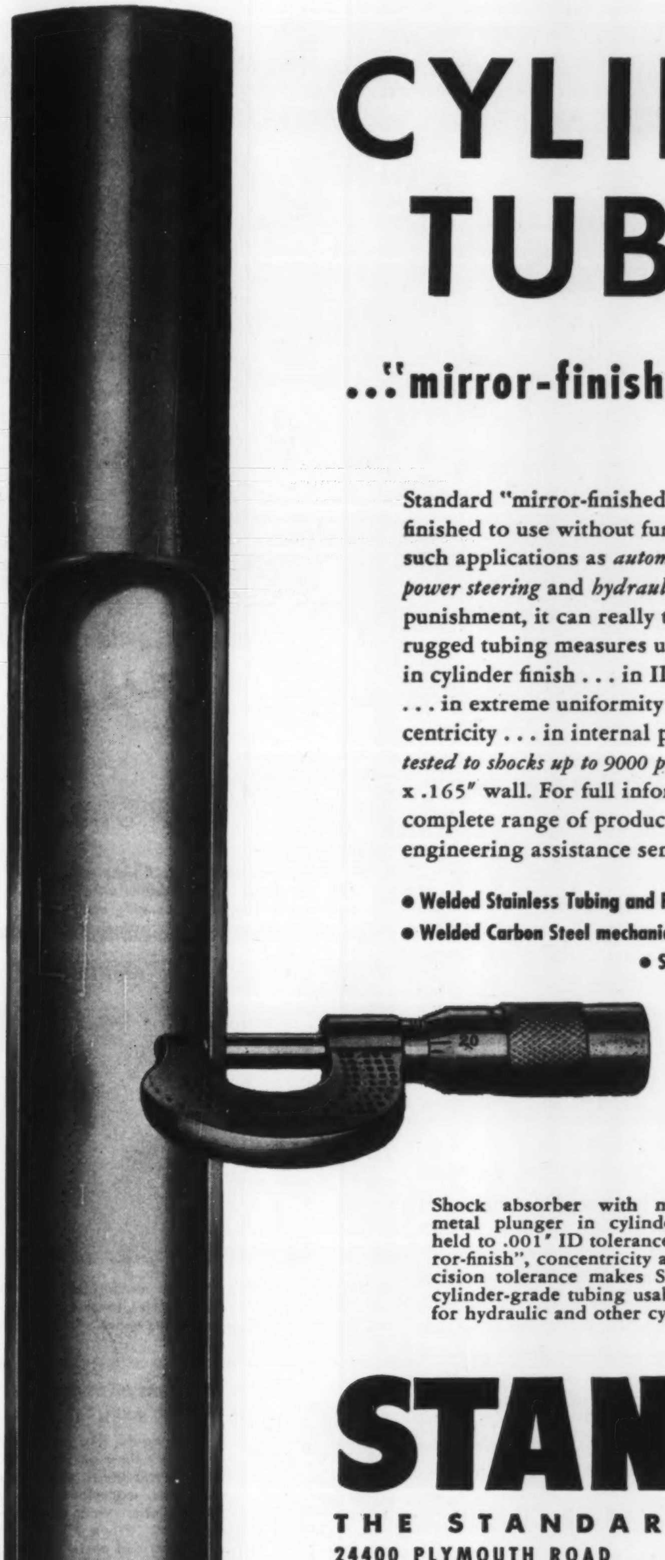


CYLINDER TUBING

..."mirror-finished" by Standard

Standard "mirror-finished" cylinder tubing is full-finished to use without further sizing or finishing for such applications as *automobile shock absorbers, power steering* and *hydraulic pumps.* When it comes to punishment, it can really take it. Every inch of this rugged tubing measures up to exacting specifications in cylinder finish . . . in ID tolerances as close as .001" . . . in extreme uniformity of wall thickness and concentricity . . . in internal pressure resistance, *tested to shocks up to 9000 p.s.i.* Cylinder sizes to 3" OD x .165" wall. For full information on Standard's complete range of products, plant facilities and engineering assistance send for *free* folder below.

- **Welded Stainless Tubing and Pipe.**
- **Welded Carbon Steel mechanical.**
- **Boiler and Heat Exchanger.**
- **Exclusive rigidized pattern.**
- **Special Shapes**

Shock absorber with metal-to-metal plunger in cylinder tube held to .001" ID tolerance. "Mirror-finish", concentricity and precision tolerance makes Standard cylinder-grade tubing usable *as is* for hydraulic and other cylinders.

Free 8-page folder on all Standard products. Write to address below.

STANDARD

THE STANDARD TUBE COMPANY

24400 PLYMOUTH ROAD • DETROIT 39, MICHIGAN

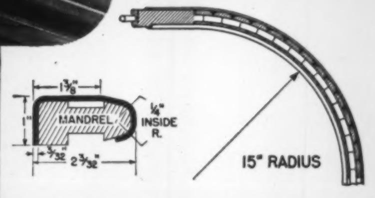
Welded stainless tubing and pipe • Welded carbon steel mechanical • Boiler and Heat Exchanger • Exclusive rigidized patterns • Special Shapes • Steel Tubing—Sizes: ¼" OD to 5½" OD —.028 to .260 wall • Stainless—Sizes: ¼" OD to 4" OD—.020 to .154 wall.

Over-all view of Pines Size 2 Automatic Bender in operation at Barber-Colman Company, Door Division, Rockford, Illinois.

Steel Channel Costs Cut 15%

AT

BARBER-COLMAN CO.



Position of mandrel and workpiece for making R.H. tracks.

L. H. track is formed with opening up.

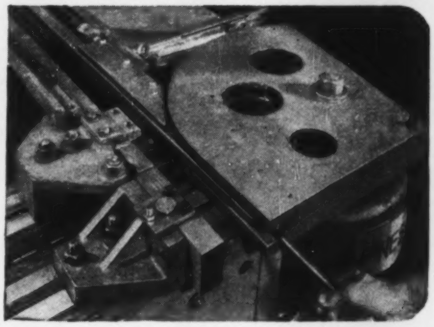
PINES AUTOMATIC BENDER

BOTH L.H. AND R.H. BENDS PRODUCED WITH SAME TOOLING

- Here's another outstanding example of how production bending the "Pines-Way" cuts costs . . . this time for Barber-Colman Company, leading manufacturer of top quality commercial and residential garage doors. By roll shaping door channels from flat stock, then cold bending in a Pines Size 2 Machine, costs have been reduced from 15% to 20%. Formerly, finished channels purchased in lots of 1,000 required extra storage space and a considerable inventory investment to meet the increased demand for "BARCOL" overhead doors. Today, the channels are easily produced as they are needed, which cuts inventory costs, reduces storage and handling problems, and improves delivery.

Smooth, Neat Bends Produced at Production Speeds

As illustrated, 90° bends are formed in HR 13-gauge (.094) steel channels on an inside radius of 15". Of special interest also is that both left and right-hand channels are formed with the same tooling. Smooth, neat bends are produced at production speeds without wrinkling or distorting. As shown in drawing, R.H. tracks are produced with opening down, and L.H. tracks with opening up, which eliminates swing of 8-foot leg. Change in angle specifications are met by the simple angle-of-bend settings on the machine. Setup and operation of machine is handled by semi-skilled machinists.



- **Closeup of tooling used for making 90° bend for right-hand track. Flexible mandrel, inserted in channel, insures smooth, wrinkle-free bends. Bending arm speed is 6.0 r.p.m.**

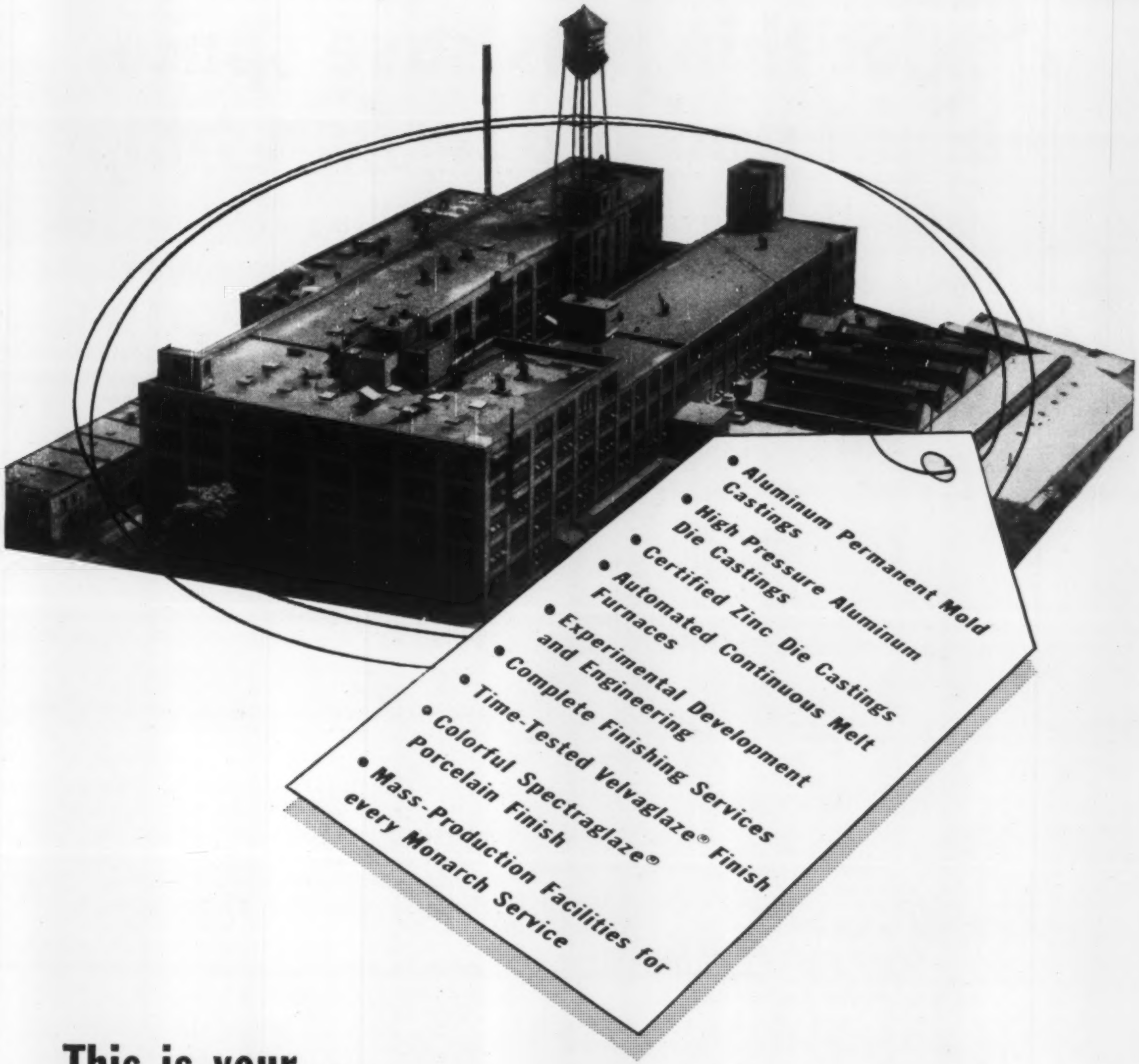
PINES ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery · 662 WALNUT · AURORA, ILLINOIS

PRODUCTION BENDING · DEBURRING · CHAMFERING MACHINERY

Write FOR MORE DATA ON LATEST COST-CUTTING APPLICATIONS . . .

If you would like up-to-date case-study data on production bending applied to steel channels, rods, extrusions, pipe or tubing jobs, write for free copies of "Pines News". Or ask for a Pines engineer to call and assist you with any tooling or production problem.



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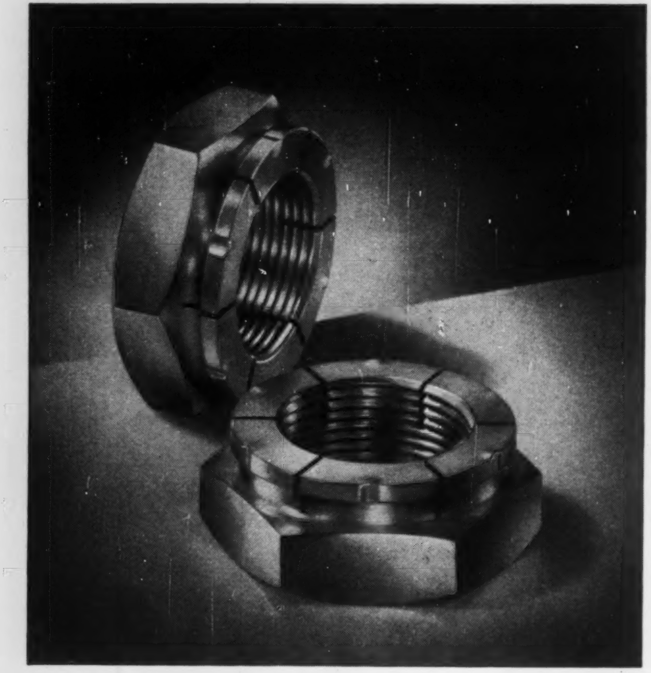
Flexloc® thin nuts save space, weight and production time



Self-locking nuts are 30% lower and lighter; speed up assembly with hand or power tools

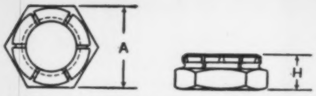
Self-locking FLEXLOC thin nuts are 30% lower than regular height locknuts of the same nominal diameter. They fit into spaces where regular height locknuts will not go. You can design lighter, more compact units with them.

Where you must reduce weight in a completed assembly, you can save by using shorter bolts with these lighter nuts. And you save production time. The length of engagement of mating threads is shorter: fewer revolutions of hand wrenches or power nut runners are needed to seat them.

FLEXLOC nuts are of 1-piece, all-metal construction. You can use a FLEXLOC fully seated as a locknut or at any point along a bolt as a stop nut. Once the threads in the resilient locking section are fully engaged, the FLEXLOC grips the mating threads with uniform locking torque wherever wrenching stops. Since there are no nonmetallic inserts to come out or deteriorate, the locking life of a FLEXLOC is virtually unlimited.

Your authorized industrial distributor stocks FLEXLOC nuts in a variety of sizes, materials and finishes. Consult him for details. Or write us for information about your special locknut problem. Flexloc Locknut Division, STANDARD PRESSED STEEL CO., Jenkintown 33, Pa.

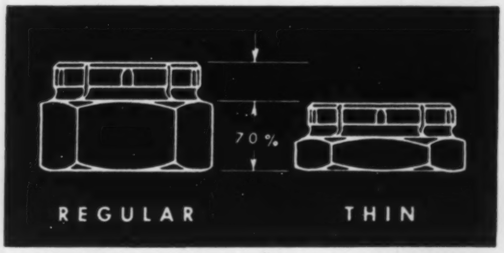
SPECIFICATIONS FLEXLOC THIN NUTS



NATIONAL COARSE THREAD—U.S.S

SIZE	A INCHES	H INCHES	WIDTH ACROSS CORNERS	WEIGHT PER 1000 NUTS
6-32	.312	.125	.361	1.8
8-32	.344	.172	.397	2.8
10-24	.375	.172	.433	3.3
¼-20	.438	.203	.505	5.4
5/16-18	.563	.250	.649	11.6
⅜-16	.625	.265	.722	14.9
7/16-14	.750	.312	.866	24.9
½-13	.813	.312	.938	28.4
9/16-12	.875	.359	1.010	36.1
⅝-11	1.000	.391	1.155	54.1
¾-10	1.125	.406	1.299	69.2
⅞-9	1.312	.469	1.516	107.5
1-8	1.500	.563	1.732	171.6
NATIONAL FINE THREAD—S.A.E.				
6-40	.312	.125	.361	1.8
8-36	.344	.172	.397	2.8
10-32	.375	.172	.433	3.3
¼-28	.438	.203	.505	5.4
5/16-24	.500	.250	.577	8.7
⅜-24	.563	.266	.649	11.5
7/16-20	.625	.312	.722	14.9
½-20	.750	.312	.866	21.7
9/16-18	.875	.359	1.010	36.2
⅝-18	.938	.391	1.082	42.4
¾-16	1.063	.406	1.227	54.5
⅞-14	1.250	.469	1.443	84.6
1-14	1.438	.563	1.660	136.3
1⅛-12*	1.625	.625	1.876	193.5
1¼-12*	1.813	.750	2.093	296.0
1⅜-12*	2.000	.812	2.309	389.0
1½-12*	2.187	.875	2.526	498.0

*Steel only (plain or cadmium plated) in stock sizes.



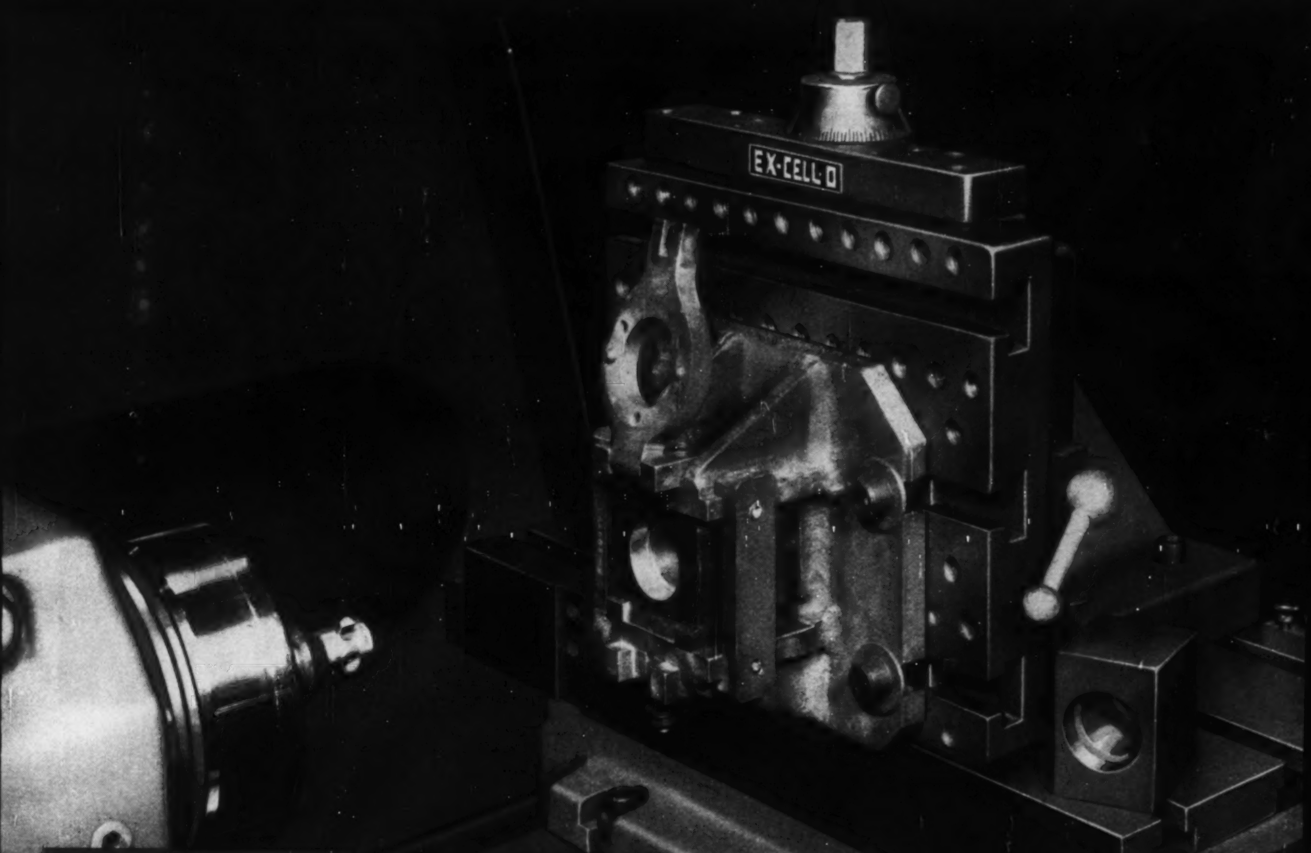
FLEXLOC thin nuts are 30% lower than regular height locknuts. There is a corresponding saving in weight. In sizes through 5/16 in., thin FLEXLOCs meet tensile strength requirements for regular height locknuts. FLEXLOC nuts can be made in the thin type because every thread, even those in the locking section, carries its full share of the load. There are no nonmetallic inserts to waste head space or weaken the structure of the nut.

Standard FLEXLOC self-locking thin nuts are available in plain or cadmium plated alloy steel, for use in temperatures to 550°F; in plain or silver plated corrosion resisting steel, for temperatures to 750°F; and in brass and aluminum, for temperatures to 250°F.

STANDARD PRESSED STEEL CO.

FLEXLOC LOCKNUT DIVISION **SPS**

JENKINTOWN PENNSYLVANIA



Close-up view of Ex-Cell-O Precision Boring Machine equipped with a single spindle and a universal fixture for small lot production.

XLO
EXCELL-O
XLO

2112-B single-end Ex-Cell-O Precision Boring Machine with horizontal cross slide fixture.

1212-B double-end Ex-Cell-O Precision Boring Machine with universal fixture having cross and vertical slides.

These versatile machines keep busy

Ideal machines for toolroom work and short production runs

These Ex-Cell-O Precision Boring Machines equipped for general-purpose work perform precision boring, turning, facing and chamfering operations quickly and economically.

They can be operated automatically or manually. Spindle speeds are easily changed through variable speed drives. Universal fixtures rigidly hold tools and workpieces of many sizes and shapes. Horizontal and vertical slides of the fixtures permit precision positioning of either tools or work.

Ex-Cell-O makes a complete line of versatile precision boring machines.

EX-CELL-O
CORPORATION

EX-CELL-O
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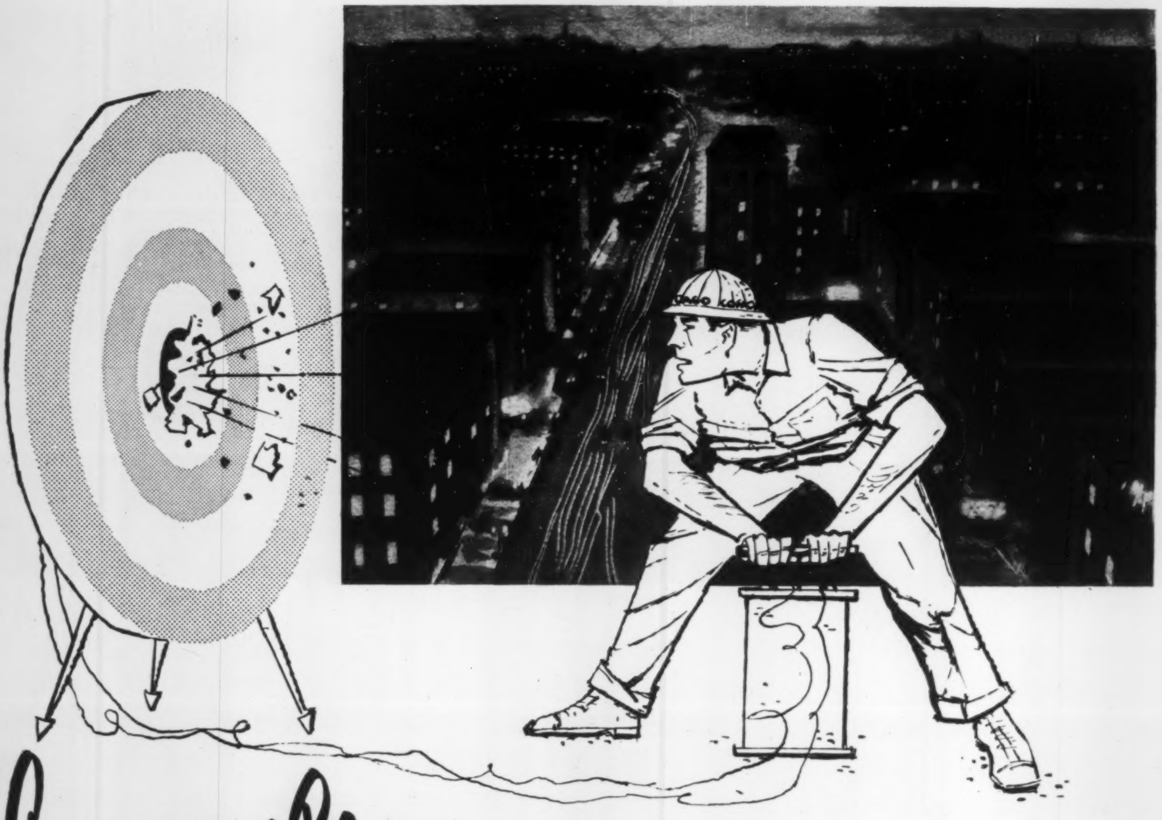
DETROIT 32, MICHIGAN MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS
RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

56-63



Controlled Blasting SAFE-GUARDS "light" FOR AN ENTIRE CITY

With better than an 80% increase in the consumption of electric power, the far-sighted engineers of a large mid-western electric power and light company decided that an addition to their main generator building was necessary. To do so meant first removing a 24" thick wall that measured 210' long by 31' high. Removing this wall in the formerly-conventional methods would not only have taken too long, but would have cost a great deal.

At this point CHICAGO CONCRETE BREAKING COMPANY'S demolition experts were called in. The question put to them: "Could dynamite be used safely on a wall that was less than five feet from operating equipment . . . equipment that meant power and light for an entire city?" The answer: CHICAGO CONCRETE BREAKING not only could guarantee to do the job of removing that wall, but would do so without disturbing the operation of that vital equipment.

In less than three weeks over 12,600 cubic feet of concrete wall was control-blasted out. A tremendous savings in time and at a cost that was but one-third of what the "old" methods would have been . . . with absolute safety to both men and equipment . . . such were the dividends that CHICAGO CONCRETE BREAKING returned to those modern-minded engineers.

If you have any rehabilitation work coming up — regardless of how complex or "tricky" it appears, phone or write today. Our 35 years of experience, know-how and ability are at your command to handle your demolition work while safeguarding your vital equipment . . . as we did in the above situation.

CHICAGO CONCRETE BREAKING CO.

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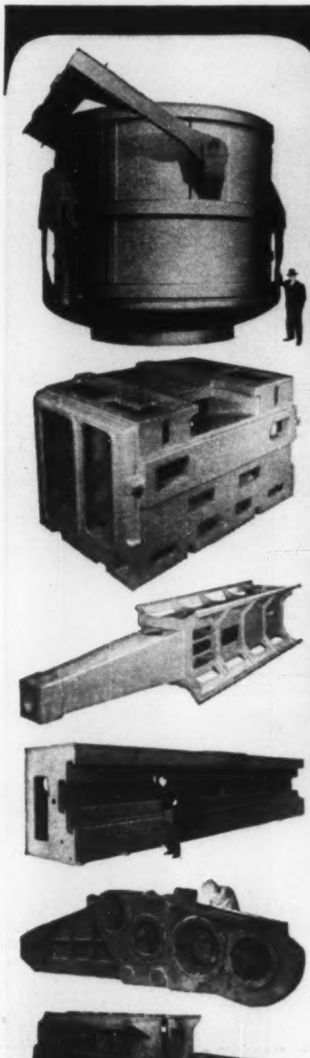


Use WELDED STEEL for Greater Strength with Less Weight!

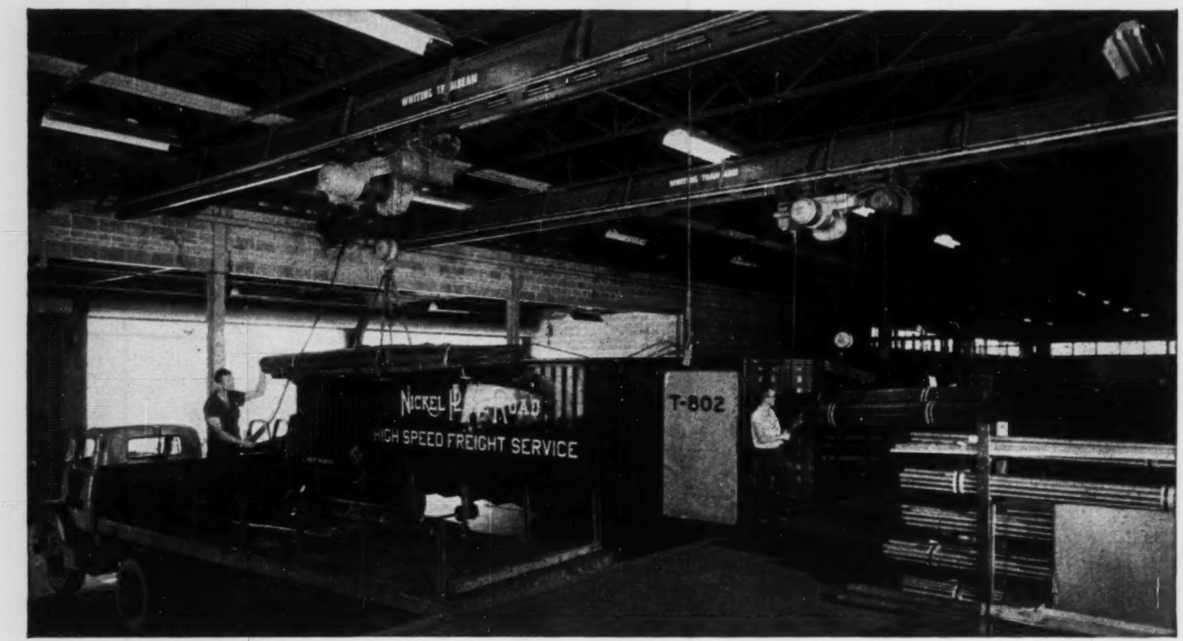
Being machined above is one of 164 Tripods produced and machined by Mahon for use in the world's largest continuous grinding and polishing machine to be employed in the production of plate glass. Weldments, in almost any type of heavy machinery give you greater strength with less weight—and the additional advantages of greater rigidity and predictability. If you can use weldments in your products, you can turn to Mahon for complete service including design, or redesign, fabrication, machining and assembling. The parts and assemblies illustrated here are typical of thousands of Steel-Weld Fabricated units produced by Mahon for manufacturers of processing machinery, machine tools, and other types of heavy mechanical equipment. You, too, will find in the Mahon organization a unique and reliable source for welded steel in any form . . . a source with unusual facilities where design skill and advanced fabricating techniques are supplemented by craftsmanship which assures you a finer appearing product embodying every advantage of Steel-Weld Fabrication. See Sweet's Product Design File for information, or better still, have a Mahon sales engineer call at your convenience.

THE R. C. MAHON COMPANY • Detroit 34, Michigan
Sales-Engineering Offices in Detroit, New York and Chicago

Engineers and Fabricators of Steel in Any Form for Any Purpose

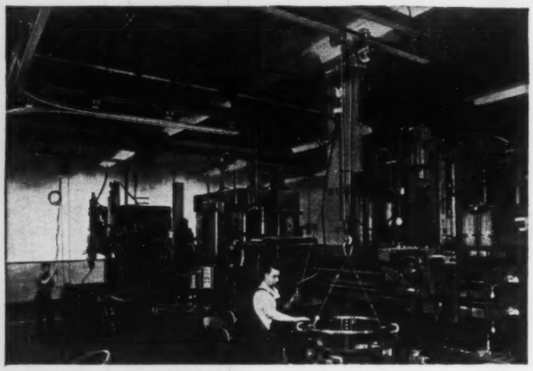
MAHON

Trambeam Handles it Overhead

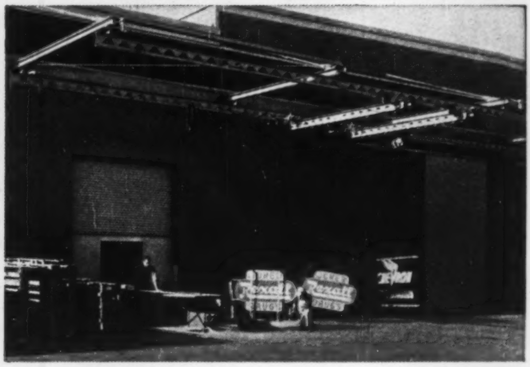


Heavy materials move from receiving and through production rapidly via Trambeam. Loads up to 15 tons travel above traffic, save valuable floor space. Track, carriers and motor drives are engineered in a range of sizes to accommodate present needs — have the desired flexibility to meet future expansion. No fumes, jammed aisles or dangerous floor traffic when Trambeam does the job!

Production Flows Smoothly



Trambeam installations are engineered to your specific requirements . . . monorail (as shown above) for point to point transport or crane for complete area coverage. Trambeam is the most efficient method of handling materials and products and the most economical!



Trambeam flexibility is a great advantage in handling materials outside the plant as well as inside. A sign company, for example, moves their products via Trambeam from raw steel through fabrication onto shipping dock as shown above.

in and out of the plant

WHITING

SEND FOR TRAMBEAM CATALOG

This 24-page Booklet gives complete information on custom engineered Trambeam Overhead Handling Systems. Photos of many installations. Write today to

WHITING CORPORATION
15643 Lathrop Avenue, Harvey, Illinois

Manufacturers of Cranes; Trambeam Handling Systems; Trackmobile, Foundry, Railroad and Chemical Processing Equipment

A Multipress case study

6-ton Denison hydraulic Multipress is used here to press valve lever over shaft; then stake lever securely to shaft.

MULTIPRESS® speeds transmission parts assembly at Chrysler

PRECISION assembly operations for automatic torque converter transmission components are performed quickly and economically by small Denison hydraulic presses at the Indianapolis plant of Chrysler Corporation.

While costs have been reduced, the high quality standards essential in a precision product have been maintained. Maximum operator safety is a Multipress bonus.

Let a Denison hydraulic engineer point the way to improvements in your production methods with the versatile Multipress. Write Denison Engineering Division, American Brake Shoe Co., 1180 Dublin Road, Columbus 16, Ohio.

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CF&I-Wickwire produces *many* different types of specialty wire. In addition, they offer you all of the advantages afforded by their modern wire-producing facilities as well as the priceless knowledge gained during their century and a quarter of wire-making experience.

Check This List!

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FLAT AND SHAPED WIRES
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- Cotter Pin Wire
- Curtain Spring Wire
- Die Spring Wire
- Gutter Broom Wire
- Lock Spring Steel
- Rake Tine Steel
- Regulator Spring Wire
- Snake Fishing Steel
- Stapling Wire for Preformed Staples (Flat)

LOW CARBON FINE AND SPECIALTY WIRE
- Bee Wire
- Bonnet Wire
- Bookbinder Wire
- Broom Wire
- Clip Wire
- Dent Spacer Wire
- Drapery Pin Wire
- Florist Wire
- Fuse Wire
- Glass Netting Wire
- Hairpin Wire
- Hook and Eye Wire
- Mattress Wire
- Picture Cord Wire
- Picker Tooth Wire
- Pin Ticket Wire
- Pin Wire
- Ring Traveler Wire
- Spiral Binding Wire
- Stapling Wire
- Stapling Wire for Preformed Staples
- Stone Wire
- Weaving Wire
- Weaving Wire for Fly Screen Cloth
- Wissco Iron Wire

HIGH CARBON FINE AND SPECIALTY WIRE
- Aircraft Cord Wire
- Armor Wire
- Belt Hook Wire
- Bobbin Ring Wire
- Brush Wire (Tempered and Untempered)
- Brush Wire (High Strain)
- Chrome Vanadium Spring Wire
- Core Wire (Aluminum Cable Steel Reinforced)
- Curtain Spring Wire
- Flexible Shaft Wire
- "Gamma" Spring Wire (Upholstery Spring Wire)
- Zig Zag Wire
- No-Sag Wire
- Hat Wire
- Heddle Wire
- Hose Reinforcement Wire
- Hose Wire, Mechanical
- Hose Wire, Vacuum and Defroster
- Rope Wire
- Signal Corps Wire
- Spoke Wire
- Hard Drawn Spring Wire
- Oil Tempered Wire
- Spheroidized or Annealed Spring Wire
- Tire Bead Wire
- Valve Spring Wire

MANUFACTURERS LOW CARBON COARSE WIRE
- Bag Tie Wire
- Basket Handle Wire
- Box Binding Wire
- Brush Handle Wire
- "Cal-Tie" Wire
- Can Key Wire
- Case Hardened Ball Wire
- Chain Wire
- Clamp Wire
- Clothes Pin Wire
- Concrete Wall Reinforcement Wire
- Garment Hanger Wire
- Hay Baling Wire (Coiled)
- Lingo Wire
- Lintel Wire
- Loop Wire
- Merchant Quality Wire
- Pail Bail Wire
- Rivet Wire
- Stapling Wire
- Strand Wire
- Tying Wire
- Welding Wire
- Wissco Iron Wire
- Industrial Quality Wire
- Cold Rolling Quality Wire
- Heading, Forging or Roll Threading Quality Wire
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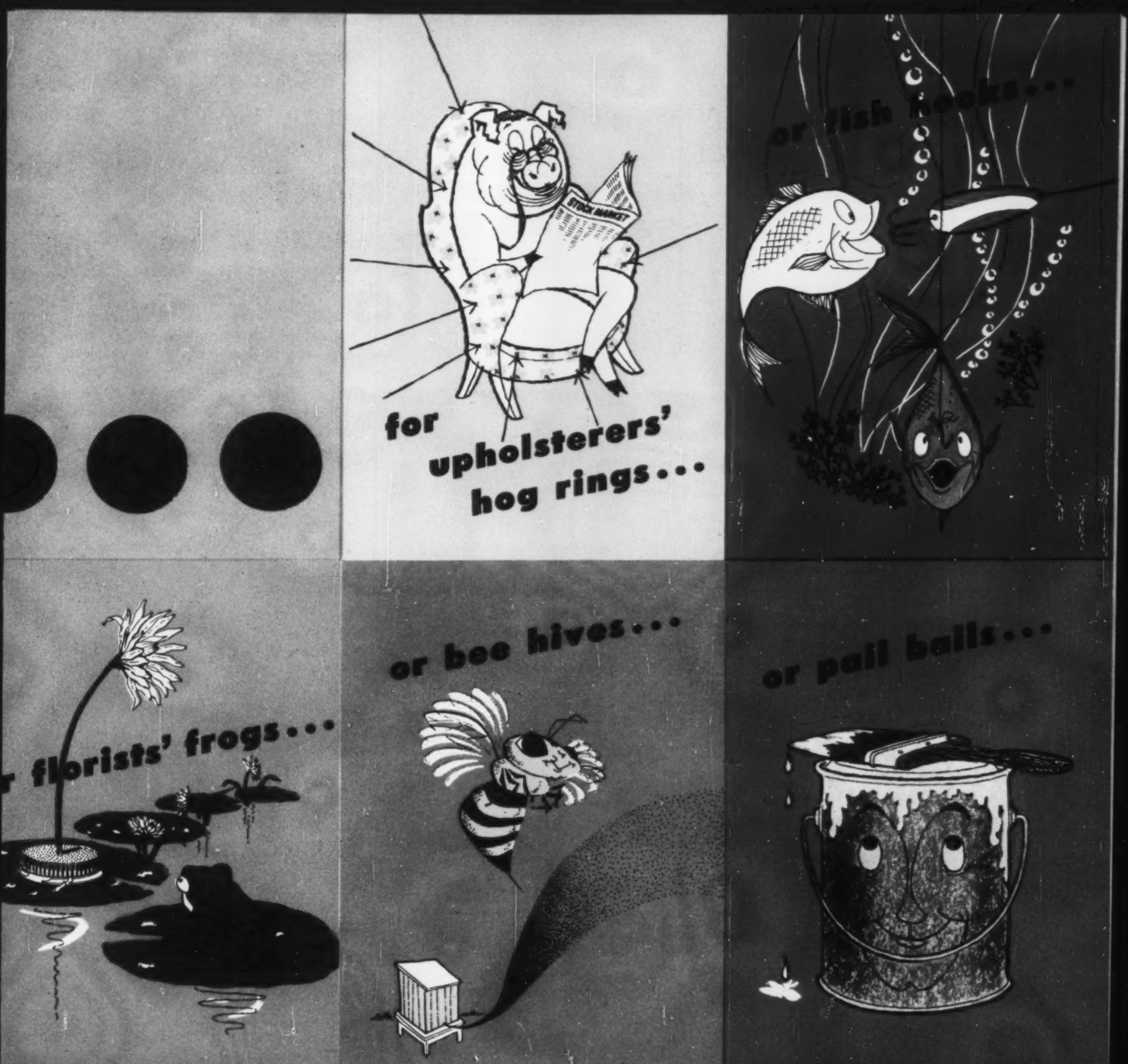
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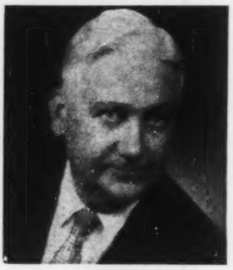
Structural Steel of this new pickling shed is exposed to severe corrosive attack from sulfuric acid vapors. A three-coat system of Bitumastic® Super Service Black was selected to protect the steelwork after tests of various materials in a similar atmosphere. The first application of this cold-applied coal-tar protective coating was made before erection of the steelwork. Two additional coats followed after the steelwork was in place. The firm's own maintenance personnel applied the coating by brushing, one of the reasons that this easy-to-apply Bitumastic coating was selected. Expected life of the three-coat system is 5 years or more before touch-up.

Concrete Waste Lines in industrial and municipal treatment systems are attacked by the liquids handled. Bitumastic coal-tar based coatings give effective protection in this service. The 60-inch diameter pipe shown was lined with a Bitumastic coating before installation in 1949. At the same time, other concrete lines were installed without lining. A recent report indicates that the coated line is in excellent condition while the unprotected lines show signs of deterioration.

Sewage and Waste Treatment plant equipment is constantly exposed to the destructive effects of corrosion from the liquids and vapors handled. Engineers in industrial and municipal waste disposal work will find this new bulletin a valuable reference in the consideration and specification of protective coatings for this environment. Write for your copy today.

how to
CUT CORROSION LOSSES
a report by Koppers Company, Inc.



W. F. Fair, Jr.
Corrosion Consultant

The two most recent reports in this monthly series have stressed the importance of good surface preparation and described methods used to clean metal surfaces prior to the application of protective coating systems. This report describes an experiment, conducted under service conditions, which illustrates striking differences in coating performance due solely to differences in surface preparation.

* * *

In 1952 speculation arose concerning the contribution of wash primer surface conditioners and of inhibitory pigmented primers, when used with coal tar coating systems. Dr. Joseph Bigos of the Steel Structures Painting Council, and editor of the Steel Structures Painting Manual, participated in the discussions, giving freely of his time and experience.

When it was decided to subject certain typical protective coating systems to an environment of known high corrosivity, two areas in the Koppers Coke Plant at Kearny, N. J., were selected. The location of this plant on tide water, fumes and "coke breeze" from adjacent ovens, saline condensation from the coke quenching, and seasonal temperature shocks assured rugged testing conditions.

The areas tested were an actifier tower and three oxide box tops, totaling nearly 5,000 sq. ft. of steel surface. Fourteen coating systems were applied in duplicate 2-foot-wide strips on the vertical actifier tower, after thorough sandblasting. Of the flat box top areas, half were cleaned by sandblasting and half by power wirebrushing, and the same fourteen coatings were applied on both of these differently cleaned areas.

Primers used were a conventional coal tar cutback, three wash primers, two epoxy red leads, two phenolics, four special proprietary formulations, and three experimental coal tar solutions. Barrier coats over primers were Bitumastic® No. 50, Bitumastic Super Service Black, and Bituplastic® No. 28. For comparison, unprimed sections received the same coatings. Bituplastic No. 28 was used to topcoat all areas.

* * *

At the end of only one year, all systems on the wire-brushed areas—both primed and unprimed—had blistered and soon showed universal disbonding. After two years, disbonding and undercutting on these areas had caused complete coating failure. Now, after more than three years, all the coating systems on the sandblasted areas—both primed and unprimed—are in perfect condition and show no signs of deterioration.

In such severe corrosion environments, it is obviously futile to consider any but the best surface preparation. Also, it must be concluded that priming cannot compensate for incomplete metal cleaning.

* * *

Our Technical Department makes semi-annual inspections of this continuing test. We'll be glad to notify you of these inspection tours if you would like to be present. Write Koppers Company, Inc., 1301 Koppers Building, Dept. 101A, Pittsburgh 19, Pa. District Offices: Boston, Chicago, Los Angeles, New York, Pittsburgh and Woodward, Ala. In Canada: Koppers Products, Ltd., Toronto, Ontario and Edmonton, Alberta.

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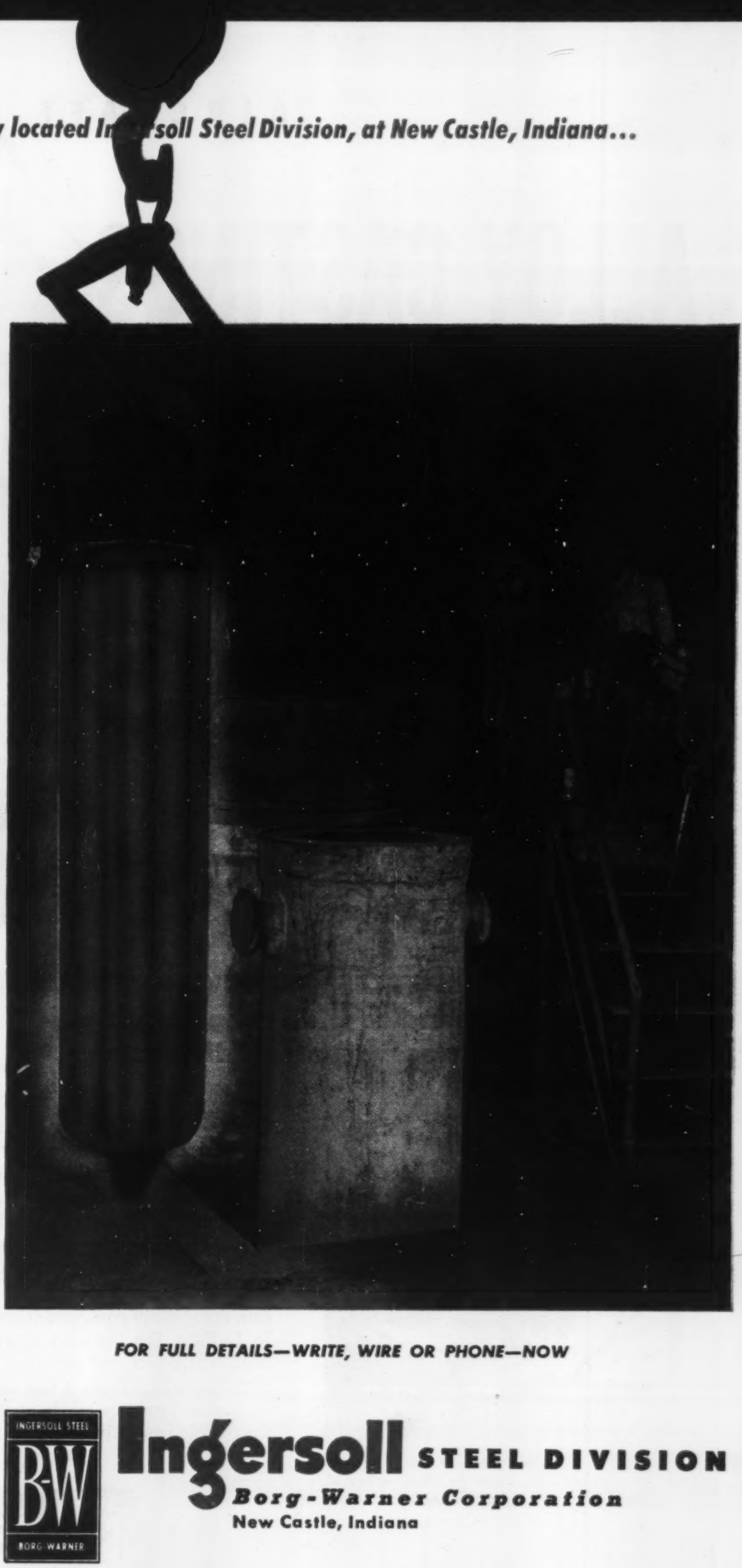

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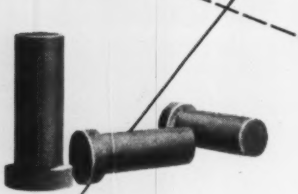

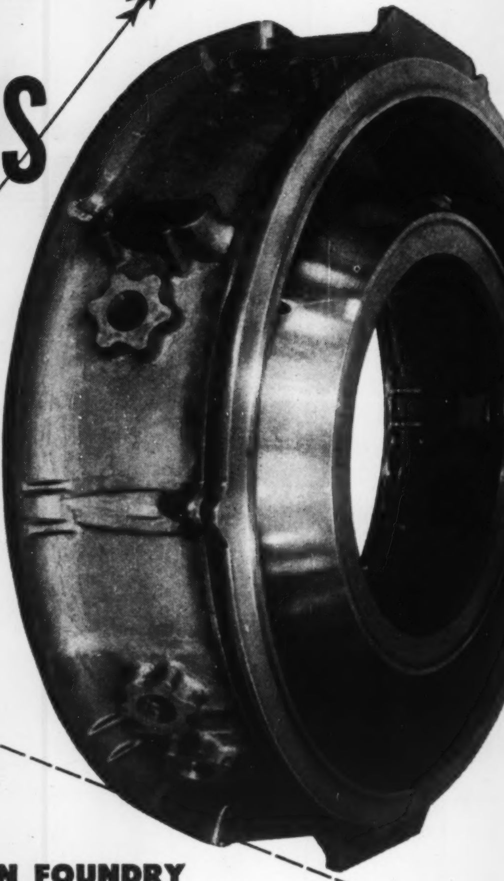

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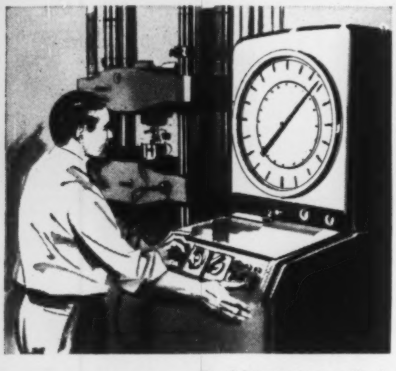

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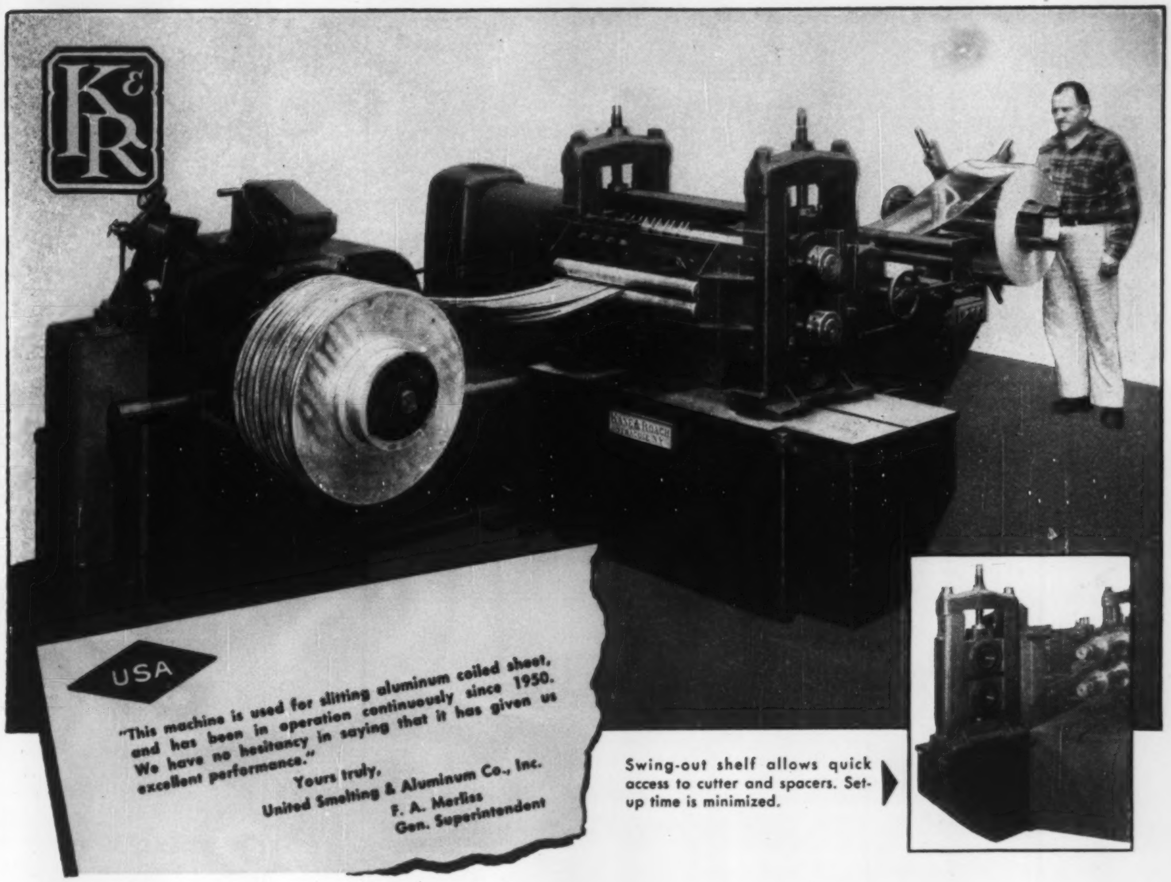

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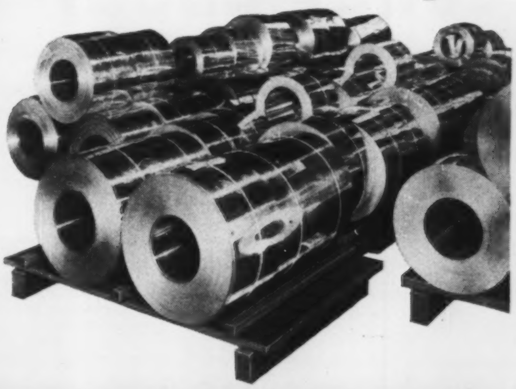

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A.O.Smith AC WELDER
A.O.Smith AC

Welding correspondent visits A. O. Smith

gets low-down on industry's most talked-about new development . . . views time-cost studies . . . comes up with revealing answer to question ——

What about C-OMANUAL ?

It's a complete, integrated package for gas-shielded (CO_2) semi-automatic hand gun welding.

Introduced to production early in 1956, C-OMANUAL is A. O. Smith's answer to the need for a fast, economical and easy-to-use semi-automatic welding process. It incorporates a new featherweight hand gun, portable control console and an A. O. Smith power source. The entire compact package requires only a few square feet of space and is perfectly adapted to an extremely wide range of production or special job requirements.

Already proving itself in plants throughout the U. S., C-OMANUAL is the most talked-about, most important welding development since the coated electrode. And the principles of CO_2 shielding have been more than adequately proved by C-OMATIC, the A. O. Smith automatic welding process.

Smith D.C WELDER
A.O.Smith D.C.WELDER

Reporter observes typical C-OMANUAL installations as operator explains ease of hand gun manipulation featuring visible arc and automatic arc length control.

It's EXTREMELY EASY to set up, use and operate... makes changing wire sizes a breeze.

With C-OMANUAL, the welder merely sets the proper current on the rectifier, pushes a start button for power. The hand gun automatically compensates for arc distance variations, and the portable control console is right at hand for fine adjustments. There's no flux to clean, no slag to remove. And the visible arc lets the welder see his work at all times.

> *WIRE: A. O. Smith has developed wires that will make sound, strong welds on all commercial steels currently in use—rim, semi-killed or killed. The characteristics of the wire include tolerance for the presence of oils, lubricants, scale, foreign material, etc.*

The console features easy-to-read, conveniently grouped controls. Large, easy-opening doors swing out for fast, simple wire reel changing. In demonstrations at various welding shows, welders were making highly satisfactory welds the first time they used the C-OMANUAL process.

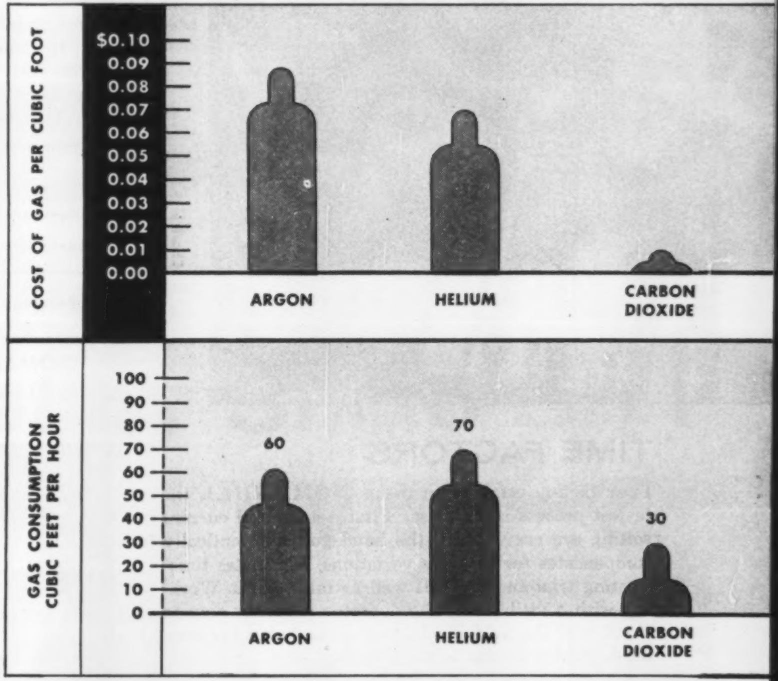
Carbon dioxide is the most efficient, economical of all shielding gases.

Lab tests, confirmed by numerous users, indicate radiographically sound welds with mechanical properties equal to the best produced by coated electrodes or by any other welding process. Tests were conducted on single, double and multi-pass butt welds . . . longitudinal, circumferential, positioned fillets and on plug and 3 o'clock welds. All were completely satisfactory.

And, as you can see in the charts at right, C-OMANUAL saves thousands of dollars annually over other shielding gases.

> *NOTE: On the following pages CO_2 welding is compared with hand electrodes and semi-automatic submerged arc. The charts above make it apparent that the high costs of Argon and Helium eliminate them from serious consideration for mild steel applications.*

The C-OMANUAL wire feed driving mechanism is contained in the console and is easily accessible. The changing of wire reels and unit inspection is extremely simple. 60-lb. coils of any diameter are self-contained in the console. Special provision for economy "pay-off" packs can be made for large users.



Charts show comparative cost per cubic foot and relative consumption rates of Argon, Helium and Carbon Dioxide. Prices are based on standard-size cylinders. For users who'll want to use C-OMANUAL extensively, CO_2 in liquid form can be purchased in bulk storage tanks, converted to gas and piped into the job for less than half a cent per cubic foot.

SEE FOLLOWING PAGES FOR TIME AND COST COMPARISONS

A. O. SMITH CORPORATION, Milwaukee 1, Wisconsin

How C-OMANUAL three other

whatever your means of measuring welding costs, C-OMANUAL comes out on top

To spotlight the tremendous advantages offered by C-OMANUAL, A. O. Smith ran tests against submerged-arc (semi-automatic) process and the two types of stick electrodes usually used for jobs of this type. Box at right gives set-up information on tests. Data pertaining to "manual submerged-arc" in all following charts was compiled from manufacturers' operation manuals.

SET-UP DETAILS ON IDENTICAL ¼", 100-FT FILLET WELDS

	E-6013	E-6024	Manual Submerged-Arc	C-OMANUAL
Electrode	1/4"	7/32"	5/64"	1/16" CO-86
Amps*	320	250	350	520/530
Volts	22/23	23/24	32	40/41
Polarity	a-c	a-c	Reverse (+)	Reverse (+)

*Detailed explanation of amp variations involves the lengthy theory of C-OMANUAL's High Current Density method. It suffices here to say amps tabulated are estimated as normal ratings for the various processes on this particular job.

TRAVEL SPEEDS AND METAL DEPOSIT RATES

In addition to inherent speed, C-OMANUAL gives the operator a visible arc. He can fully utilize its high speed and fast metal deposit because he just pulls the trigger, follows the joint until the weld's complete. There's no need for stops to check his progress, no interruption when he moves from pass to pass.

Chart I

	E-6013	E-6024	Manual Submerged-Arc	C-OMANUAL
Travel Speed (ipm)	12.5	18.5	21.4	40.0
Deposit Rate (lbs/hr)	6.65	9.81	11.4	21.0

C-OMANUAL is 84% to 220% faster . . . deposits 87% to 216% more metal per hour than other processes

TIME FACTORS

Four factors combine to make C-OMANUAL the fastest process in its class. First, set-up and current setting are easy. Next, the hand gun automatically compensates for distance variations, eliminates time-wasting trial-and-error as well as false starts. Working with a visible arc, the operator need not stop to check how the weld is progressing. Last, but far from least, there's no slag to chip, no flux.

Chart II

Time (hrs.)	E-6013	E-6024	Manual Submerged-Arc	C-OMANUAL
Arc	1.590	1.080	0.930	0.500
Electrode Change	.075	.066	—	—
Slag Removal	.130	.084	0.120	—
Total	1.795 (1 hr, 40 min)	1.230 (1 hr, 15 min)	1.050 (1 hr, 3 min)	0.500 (30 min)

C-OMANUAL completes 100-ft weld 110% to 259% faster than other processes

stacks up against welding processes

COST FACTORS

The figures in the chart below have been compiled on the basis of the tabulations in charts I and II. All cost figures are based on an *exact* (by weight) ¼" fillet 100 ft in length. It's interesting to note that if the "overhead" or burden figure were increased, the advantage in favor of C-OMANUAL would become even more pronounced.

Chart III

Cost	E-6013	E-6024	Manual Submerged-Arc	C-OMANUAL
Labor @ $2.50/hr	4.49	3.08	2.63	1.25
Overhead @ 150%	6.74	4.62	3.95	1.88
Power @ .01/kwh	.14	.08	.17	.17
Flux	—	—	1.43	—
Gas (CO_2) @ .01/ft^3	—	—	—	.15
Electrodes or Wire	2.09	2.86	1.38	3.09
Total	$13.46	$10.64	$9.56	$6.54

RESULT— based on charts I, II and III

...C-OMANUAL

cuts total welding cost per 100 feet by 31% to 51%!

If you'd like to know more about C-OMANUAL, get graphic proof how it can greatly improve your present set-up, cut costs, win favor with welders, too, write direct for comprehensive details. Please describe, briefly, the type of work you're currently handling or planning to do. Address inquiries to A. O. SMITH, WELDING PRODUCTS DIVISION.

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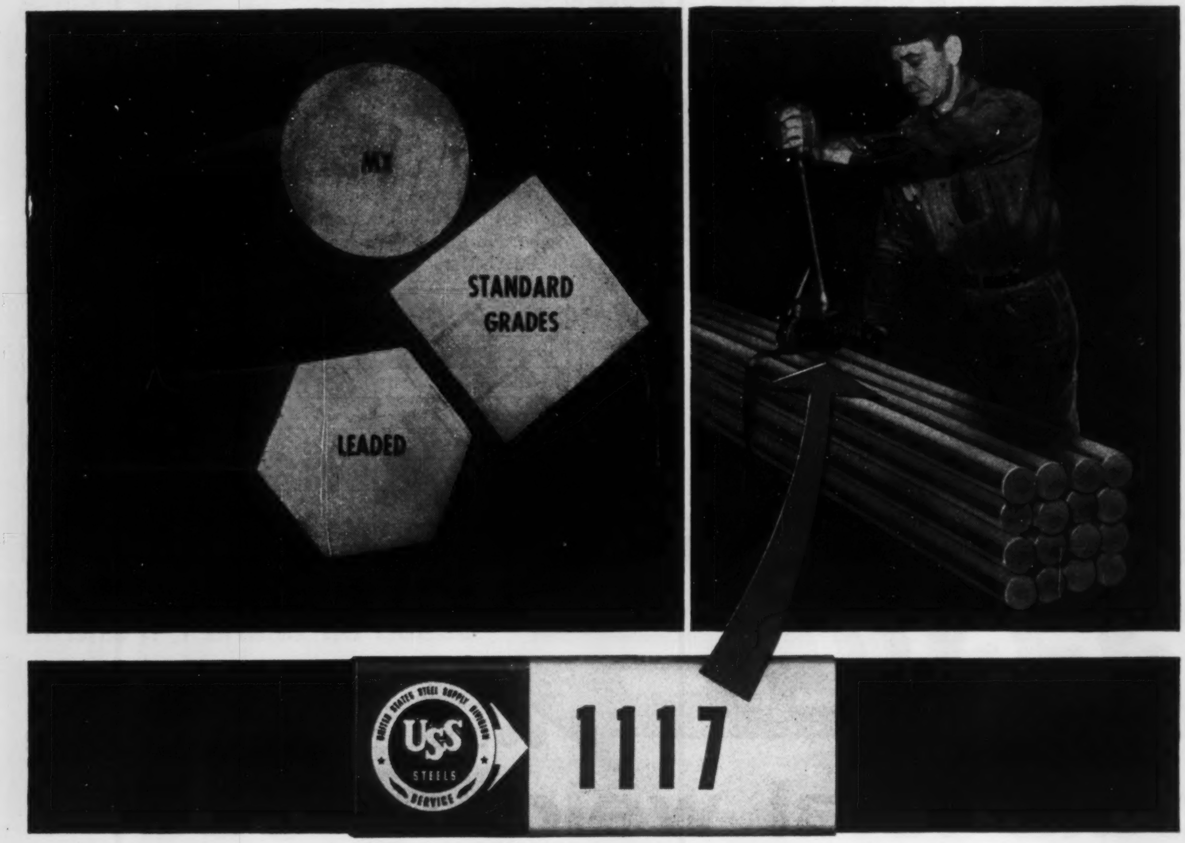

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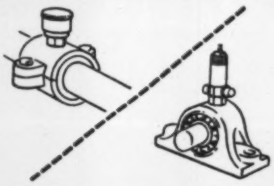
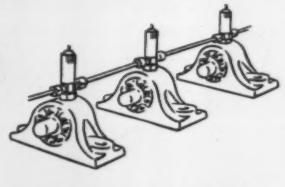
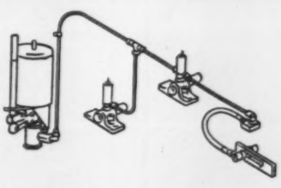


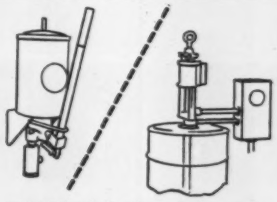
Replace grease cups or grease fittings with Accumatic fittings. (Available in same thread sizes as grease fittings, cups.)



Connect Accumatic fittings with copper tubing. (Alemite has tubing, clips and accessories for easy installation.)



Connect sliding, rotary or oscillating parts into tubing system. (Flexible hose and swivels for moving parts.)



Provide central pump to supply lubricant to system. (Ordinary hand pump or fully automatic barrel pump.)

The fitting that "thinks for itself!"

The Alemite Accumatic System eliminates the work, worry and "human error" of manual lubrication. It fits directly on bearings—meters an exact shot of oil or grease automatically—at predetermined intervals—while the machine operates. Cuts labor, production and maintenance costs!

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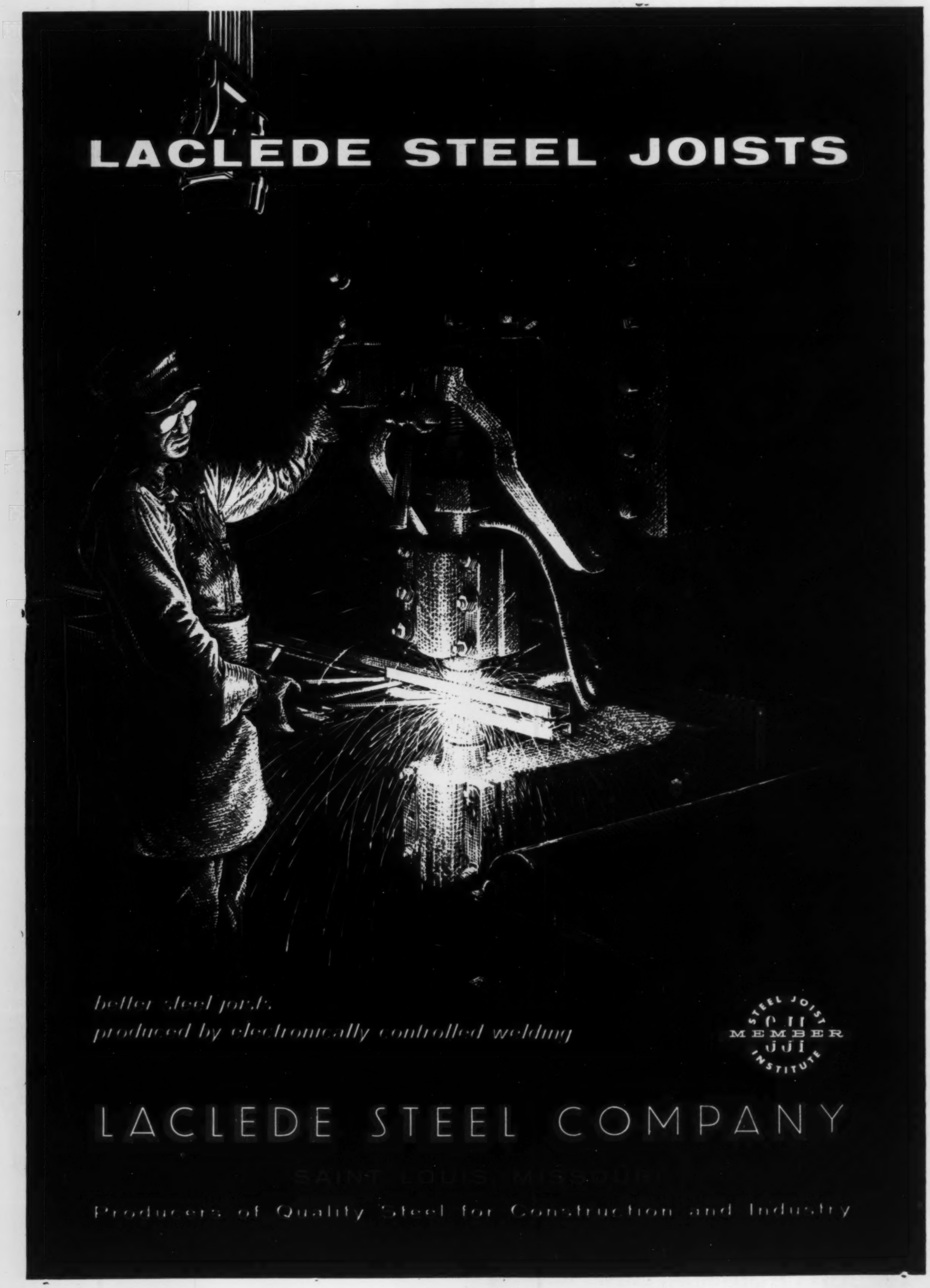

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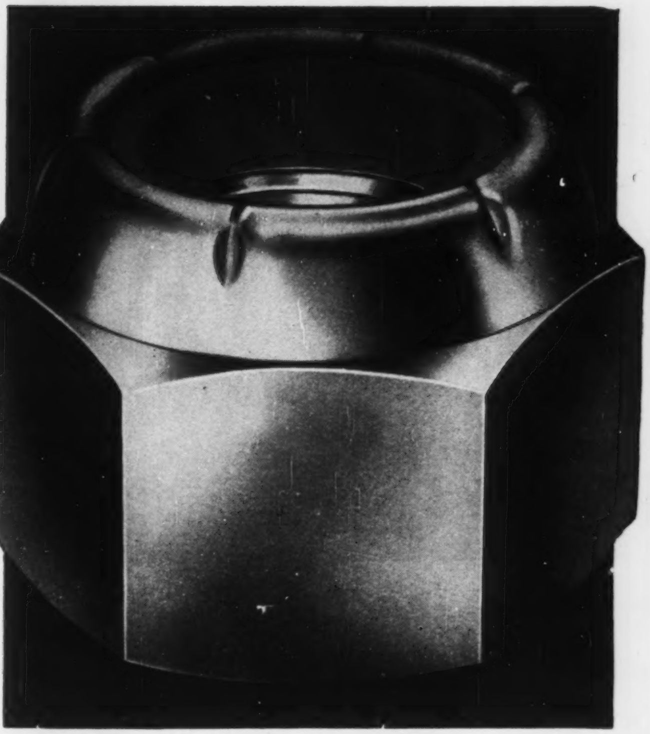
What's special about this STOP NUT?

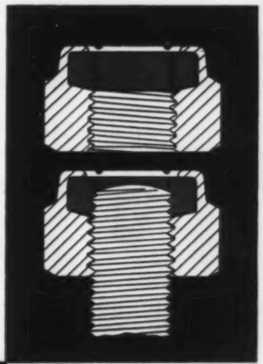


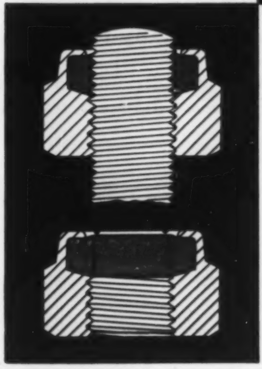
Several things make this nut unusual. For instance, you can "stop" it at any position on the threaded length of the bolt . . . or wrench it tight against the work where it protects bolt threads against corrosion and prevents liquid leakage. No matter where you leave it on the bolt, it will remain tight in that exact position, even though you subject it to heavy vibration and shock loads. But use a wrench on it and it comes off as easily as it went on. The red locking collar is nondestructive—does not gall bolt threads or remove plating. You can remove it and re-use it again and again.

What gives it its grip?

1 The locking collar is unthreaded and elastic. It has an inside diameter smaller than the major diameter of standard bolts.

2 The bolt impresses a mating thread into the collar and the resulting compressive forces exert a constant friction grip on the bolt. . . .





3 and exert a downward thrust bringing the lower flanks of the bolt thread into firm metal to metal contact with the matching nut threads, eliminating normal axial play.

4 Nut is removable and reusable . . . the Red Elastic Collar retains its grip after repeated usage.

Will it hold under ALL conditions?

The locking principle of the Elastic Stop® nut has been tested and proved by over 25 years of actual field service. Elastic Stop nuts are used on locomotives . . . and pile drivers. They fasten hedge shears and harvesters, drilling rigs and washing machines, trucks and roller skates. And no Elastic Stop nut customer has ever stopped using them because of unsatisfactory performance.

What about sizes and materials?

Elastic Stop nuts are available from a watchmaker's 0-80 all the way to 4"—in materials that include stainless steel, brass, aluminum and other alloys. Protect your product with "fastener insurance." Try Elastic Stop nuts on trouble spots, whether to protect expensive heavy equipment from costly downtime or to guarantee the accuracy of delicate electrical equipment by maintaining precision adjustments. We'll supply free test samples.

ESNA® TRADE MARK

ELASTIC STOP NUT CORPORATION OF AMERICA

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Please send the following free fastening information:

☐ ELASTIC STOP nut bulletin

☐ Here is a drawing of our product. What self-locking fastener would you suggest?

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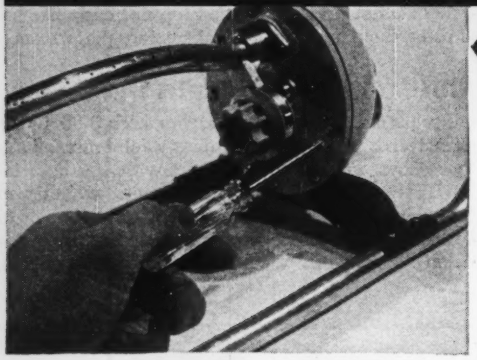
Investigate the assembly savings made possible by P-K® self-tapping screws

Because P-K Type A Self-tapping Screws have clean, deep slots and sharp gimlet points . . . and because they are consistently uniform, Reznor Mfg. Co. enjoys important savings in the assembly of their gas heaters.

To hold the plastic handle halves of their Instant Heat Soldering Irons together, The Lenk Mfg. Co. specifies P-K Type F Self-tapping Screws. No need for a separate tapping operation. Production is increased and costs reduced—thanks to P-K Screws.



Melnor Industries, Inc. (formerly Melnor Metal Products Co.) puts assembly strength into their famous "Swingin' Spray" oscillating lawn sprinkler by fastening zinc and aluminum parts with P-K Self-tapping Screws — 7 Phillips Head Type Z and 18 Type F. They start right . . . drive right . . . and stay tight.

***PARKER-KALON DIVISION,** General American Transportation Corporation*
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Sold Everywhere Through Leading Industrial Distributors
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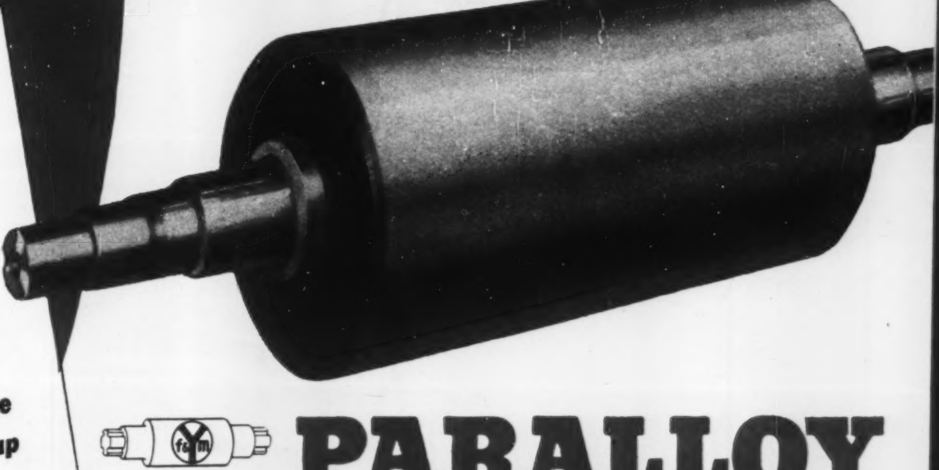
Get the right answers to your Roll problems

from "YOUNGSTOWN"

hot and cold strip mill maintenance specialists



Q. How can scratching, galling, pickup, and excess wear be eliminated?

A. Use PARALLOY... the Rolls of uniform hardness all through. Roll more tonnage from new to scrap diameter.

PARALLOY

HOT STRIP COILER ROLLS • COILER PINCH ROLLS
PICKLING LINE PINCH ROLLS • UPCOILER ROLLS
CLEANING LINE PINCH ROLLS • SINKER ROLLS
CARRIER ROLLS • TEMPER MILL TENSION ROLLS

Q. How can heat check, warpage and cracking be overcome?

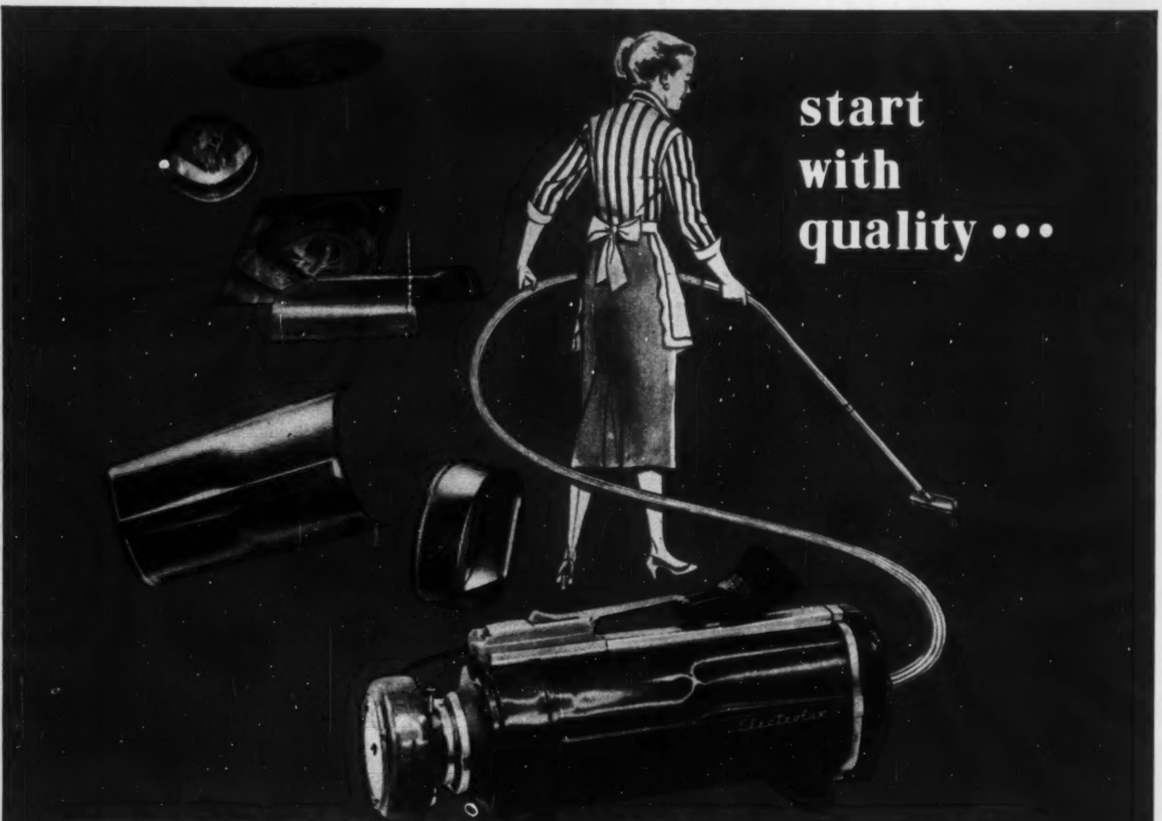
A. Let Youngstown's proven experience with Ductile Cast Iron help you in the applications at right.

DUCTILE IRON

RUNOUT TABLE ROLLS • HOLDING TABLE ROLLS
LOOPER TABLE ROLLS
LOOPER TABLES • APRON PLATES

Ductile Cast Iron Rolls are reducing maintenance in hot strip mills . . . especially good under the sprays. We invite your inquiries on rolls or any other ductile iron castings up to 50,000 pounds.

The Youngstown Foundry & Machine Co.
SERVING INDUSTRY SINCE 1883
Youngstown, Ohio



STEEL WITH SELLING POWER...
A.W. Cold Rolled

Modern Electrolux® vacuum cleaners get a quality start—in just one of many aspects—in that body sections and rear covers are stamped from Alan Wood cold rolled sheet. The stamping demands are neither difficult nor easy, but because of careful study and testing, represent a happy mating of basic material and performance requirements.

The sheet, which had *its* beginning in scientifically chosen high-grade ores from Alan Wood mines, meets or betters Electrolux demands for gauge, finish, uniformity and performance—resulting in maximum production efficiency and minimum rejects because of material quality.

Alan Wood's initial demands upon itself for precise metallurgical study and quality control provide, we believe, a supplementary sales feature for Electrolux. This feature is a basic material of such consistent uniformity and high quality as to contribute reliability to the end product—a basic requirement for volume sales.

For detailed information on any Alan Wood product, write Marketing Division, Dept. CR-S70.

ALAN WOOD STEEL COMPANY

steelmasters for 131 years • *CONSHOHOCKEN, PENNA.*

DISTRICT OFFICES AND REPRESENTATIVES: Philadelphia New York • Los Angeles • Atlanta • Boston • Buffalo • Cincinnati Cleveland • Detroit • Houston • Pittsburgh • Richmond • St. Paul San Francisco • Seattle

Montreal and Toronto, Canada—A. C. Leslie & Co., Limited

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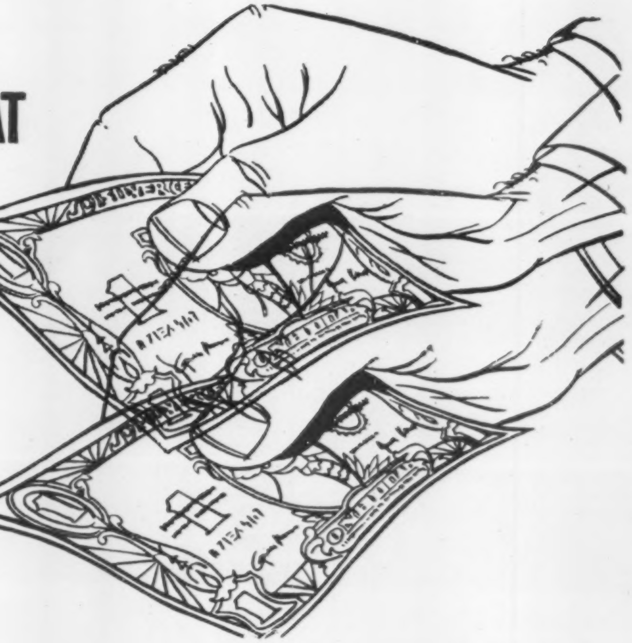
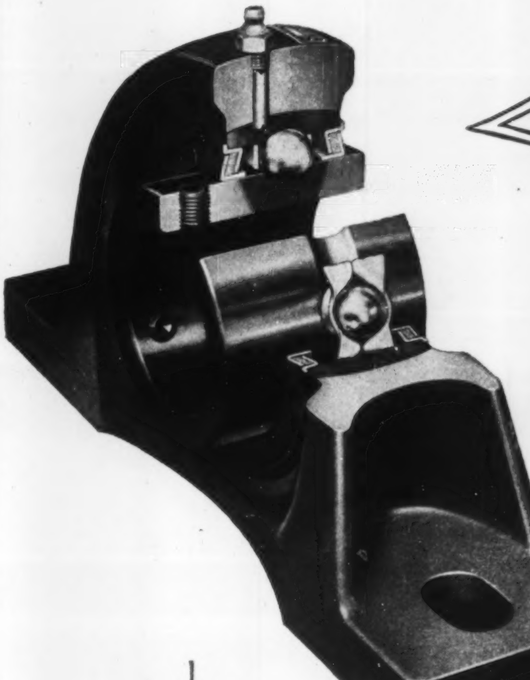
  - "Swede" *pig iron*
- STEEL PRODUCTS
  - *Plates (sheared)*
  - *A.W. Dynalloy (high strength steel)*
  - *Hot rolled sheets*
  - *Hot rolled strip*
  - *Cold rolled sheets*
  - *Cold rolled strip*
- ROLLED STEEL
- FLOOR PLATE
- A.W. ALGRIP
  - *abrasive*
- A.W. SUPER DIAMOND *pattern*
- COAL CHEMICALS
- A.W. CUT NAILS
  - *Standard & Hardened*
- MINE PRODUCTS
  - *Iron ore concentrates*
  - *Iron powder*
  - *Crushed stone*
  - *Sand*
- COKE
  - *Foundry, industrial & metallurgical*
- PENCO METAL PRODUCTS DIVISION
  - *Steel cabinets, lockers & shelving*

HERE'S ONE DOLLAR THAT BUYS MORE THAN IT DID 25 YEARS AGO!





. . . the dollar you invest in

SEALMASTER

BALL BEARING UNITS

for products you build or buy!

Purchasing power of the dollar may have gone the way of the five cent cigar, but year after year SEALMASTER Bearing Units give you more and more for your component purchasing dollars.

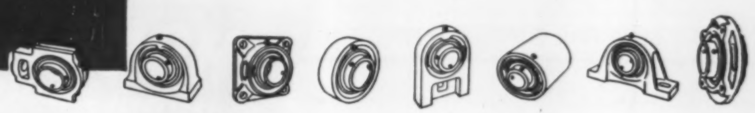
SEALMASTER research and engineering continues to bring you the latest advances in bearing design and manufacture. SEALMASTER Bearing Units contain a combination of patented features you will find in bearing units of no other make.

SEALMASTER has a complete line of bearing units to answer all your requirements for outstanding bearing performance.

Factory Representatives and Dealers Located in All Principal Cities

SEALMASTER

BALL BEARING UNITS



SEALMASTER BEARINGS A DIVISION OF STEPHENS-ADAMSON MFG. CO. • 99 RIDGEWAY AVE., AURORA, ILLINOIS

HEAT COSTS MONEY...

HOUGHTON Cold Cleaners Save It!

Stacks, fans, boilers, pipe and fittings . . . fuel bills . . . steam, humidity . . . fire hazard . . . sweating, uncomfortable workers . . . toxic fumes. Any way you look at it, old fashioned methods of cleaning metal parts are costly.

But there is a better, money-*saving* way! Houghton cold cleaners are used at room temperature. They eliminate the need for costly, uncomfortable heating of cleaning compounds. They eliminate the dangers and toxicity of low flash point solvents. And they do a better, quicker, more thorough cleaning job on ordinary shop soils at less cost!

Take the first step now to modernize and improve your metal cleaning processes. Ask your Houghton Man about these new Cold Cleaners, or write direct to E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

ELIMINATE **HEAT**

ELIMINATE **FIRE HAZARD**

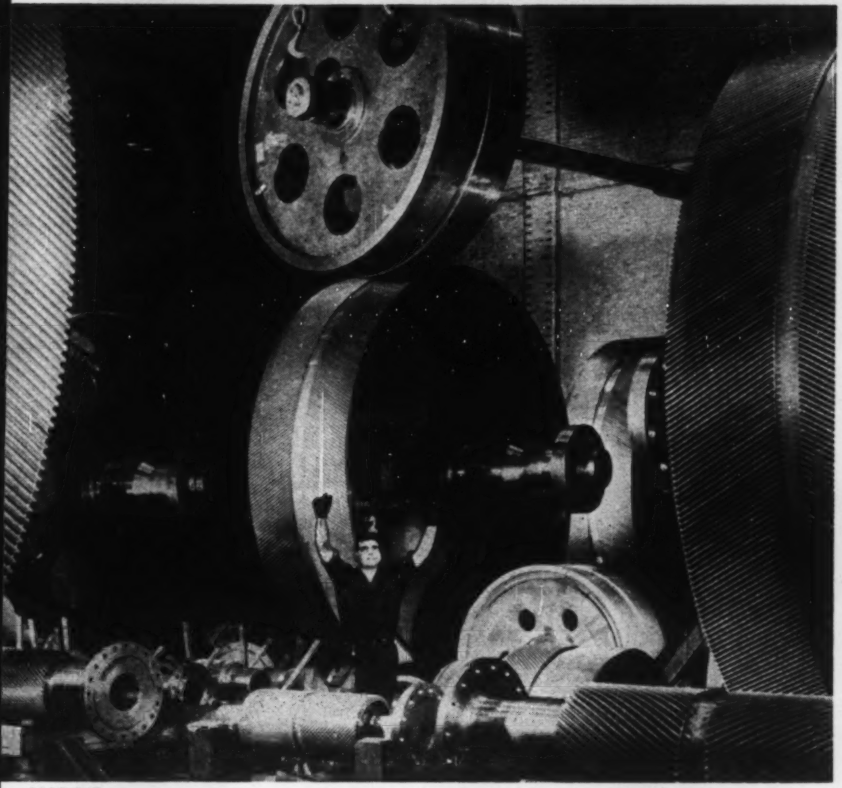
ELIMINATE **TOXICITY**

HOUGHTO-CLEAN COLD CLEANERS . . . products of

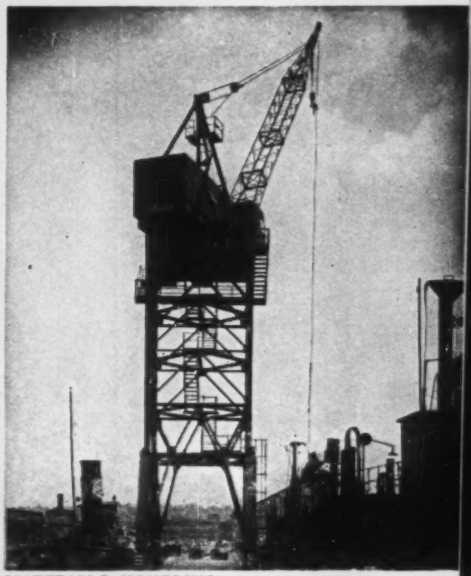
E. F. HOUGHTON & CO.
PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO

Ready to give you on-the-job service . . .

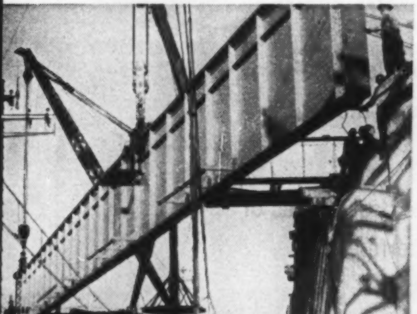
BARIUM STEEL—active in America's growth



MARINE propulsion gears, an integral part of General Electric ship propulsion units, use steel plate from Barium's Phoenix Iron & Steel Company, Plate Division. These massive web plates are welded to forged steel rims and hubs—the most practical method of construction for large diameter marine gears (up to 16⅔ feet). In addition to steel plate Phoenix also produces structural steel shapes, heavy wall seamless pipe, and turns out large and small steel fabrications.

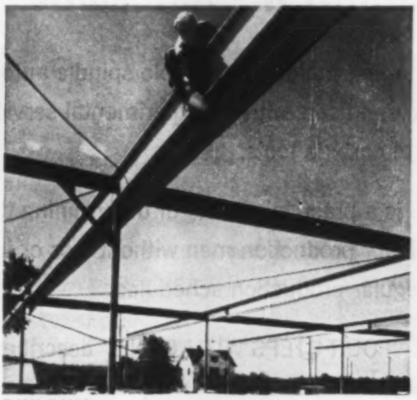


MATERIALS-HANDLING at this East Coast shipyard centers around the Clyde crane above with its 20-ton capacity, 65-foot reach and mobile 70-foot tower. It's only one of many cranes that Barium's Clyde Iron Works has supplied to this customer. If you've got a materials-handling problem coming up, chances are a Clyde crane, hoist or unloader can give you the lift you're looking for.

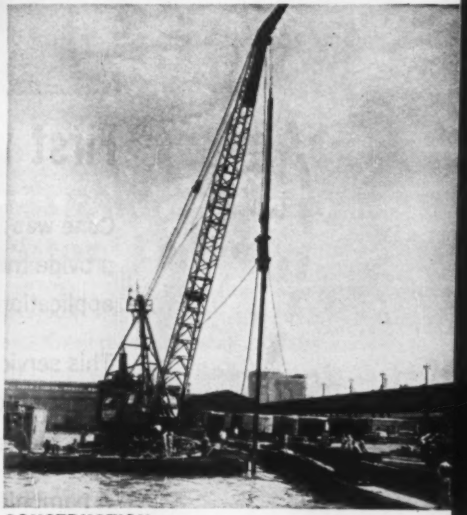


HIGHWAY builders timed the installation of this 132-ton, 180-foot-long girder fabricated and erected by Barium's Phoenix Bridge Company at an incredible 27 minutes. This Phoenix-built bridge will carry the New England Thruway over the 4-track main line of the New York, New Haven and Hartford at New Rochelle, New York. Part of the credit for quick work against a tight railroad schedule goes to the Barium-built 100-ton Clyde derrick.

Project of New York State Dept. of Public Works. General Contractors: Arthur A. Johnson Corp., MacLean Grove & Company, Inc.



BUILDING going up here (New Providence, New Jersey) is a new plant for EXCO, Inc. Structural steel comes from Barium's Phoenix Iron & Steel, Structural Division. Elizabeth Iron Works of Elizabeth, N. J. are steel contractors on this job; they find Barium a good company to work with on small as well as large jobs.



CONSTRUCTION of New York's 30th Street Heliport began as this Wiley floating crane with its 110-foot boom slammed the first steel pile down to bedrock. Barium's Wiley Manufacturing Company, the nation's largest manufacturer of floating cranes, built this one for George W. Rogers Construction Corp., contractors for the Port of New York Authority. Wiley also produces work boats and steel barges.

BARIUM
STEEL CORPORATION
A GROUP OF INTEGRATED COMPANIES

Steel producers, fabricators, product manufacturers

For further information on this close knit, alertly managed team of companies—its engineering resources, production facilities or specific products—write for "The Barium Story" to:

25 BROAD STREET, NEW YORK 4, N. Y.

64

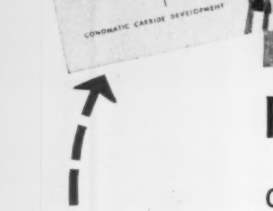
CONE
WITH
STEPS
FOUR
CONOMATIC CARBIDE DEVELOPMENT

First with NEW "Automatic" Service

Cone was the first builder of multiple spindle automatics to provide machine users with an experimental service in the application of carbide tools.

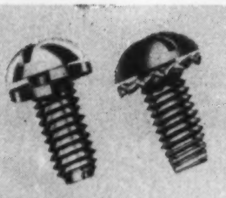
This service is a practical means of determining the possibilities of carbide tools for production men without loss or interference with their regular production schedules.

A pamphlet "FOUR STEPS WITH CONE" describes this service. Send for your free copy.



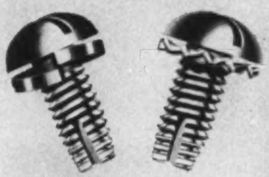
Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U.S.A.



SPRINGTITES AND SEMS

SNAP RINGS

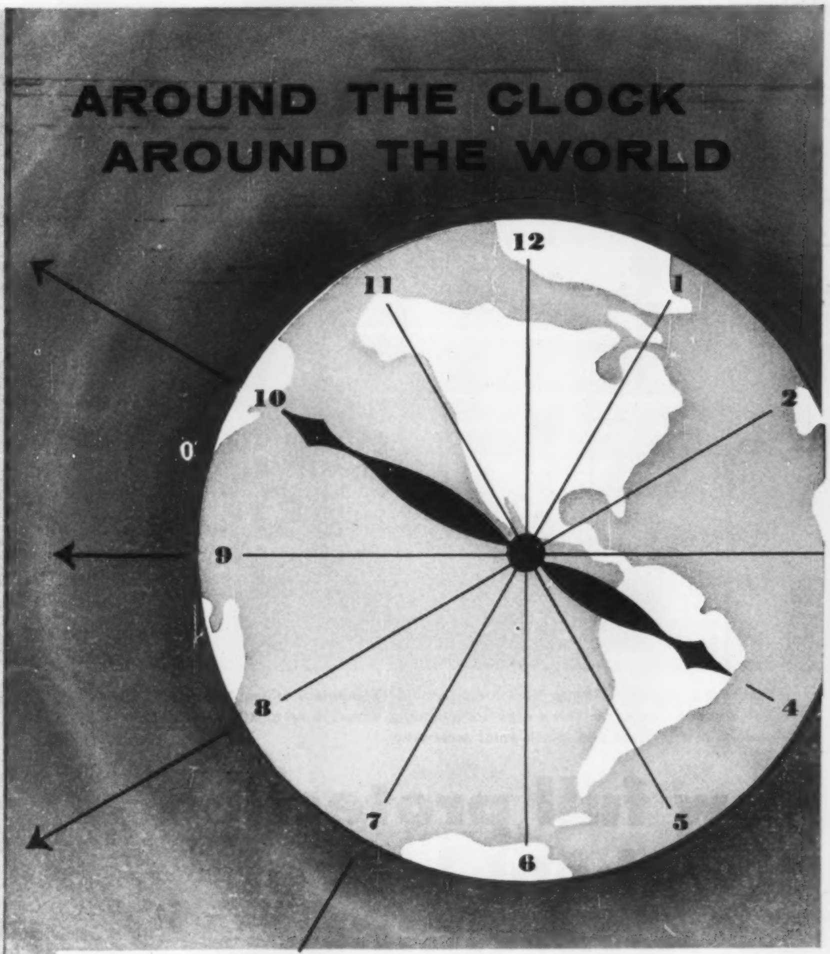


THREAD-CUTTING SPRINGTITES AND SEMS

EATON KEPS®

HOZ-FAS-NERS®

SPRING LOCK WASHERS



Eaton-Reliance Fasteners Keep Assemblies Tighter Longer

Used to advantage wherever assemblies are fastened together, Eaton-Reliance products will be found throughout industry . . . railroad, automotive, appliance, electric, heavy and light machinery, aircraft, and many others. They are manufactured of quality controlled materials to rigid specifications, and are designed to reduce assembly costs and speed up production. There's an Eaton type fastener for your particular needs. Send for free Engineering Bulletin giving details. Just name the fasteners in which you are interested.

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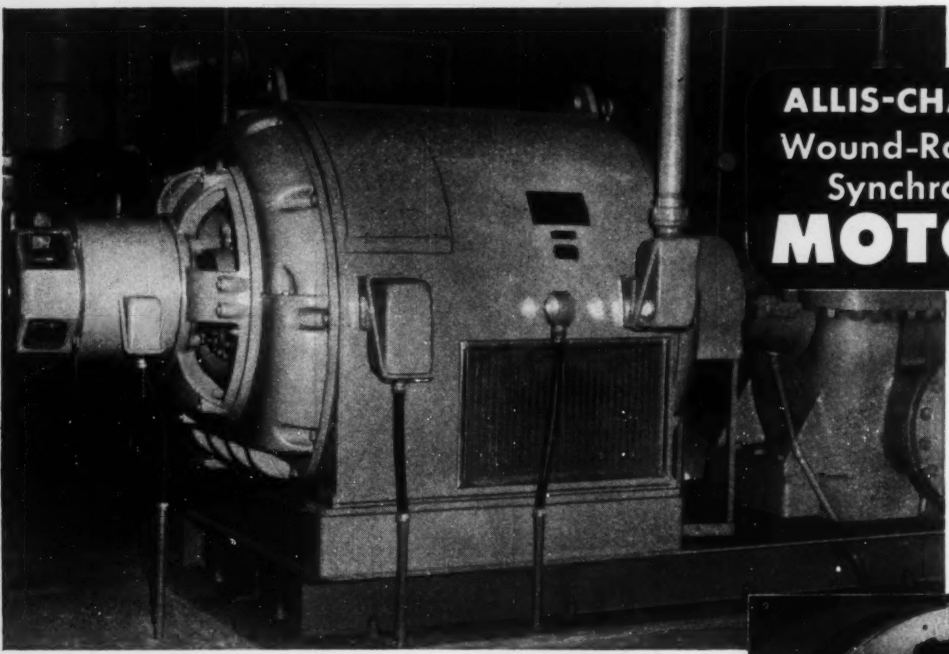
RELIANCE DIVISION
MANUFACTURING COMPANY
514 CHARLES AVENUE • MASSILLON, OHIO

SALES OFFICES: New York • Cleveland • Detroit • Chicago • St. Louis • San Francisco • Montreal

PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

ALLIS-CHALMERS
Wound-Rotor and Synchronous
MOTORS



Shown is a 400-hp, 900-rpm end-shield bearing synchronous motor. Other Allis-Chalmers motors of this design are available from 250 hp at 300 rpm and up, in drip-proof and splash-proof construction.

Now full protection without loss of accessibility

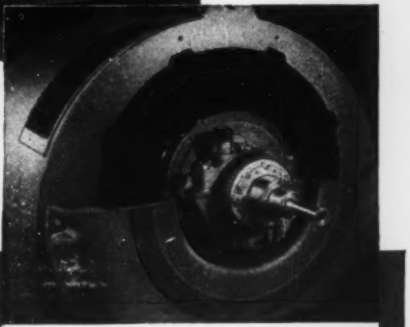
All parts, including slip rings and leads, are enclosed — yet removable inspection covers and end-shield sections simplify maintenance.

These motors combine modern functional design with maximum protection and accessibility.

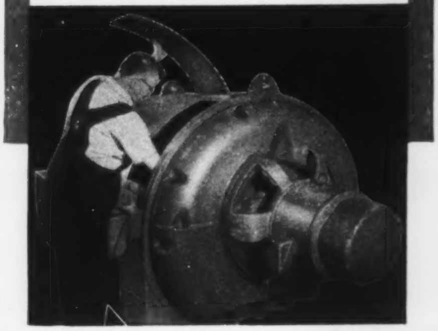
Here are some of the important features:

- Collectors and brushes are protected by box-type stator yoke from physical damage, dripping moisture, dust and dirt.
- Cast end shields provide rigid bearing support and full protection for motor windings.
- Slip-ring leads are brought out to a terminal box — they are not left exposed.
- Capsule-type sleeve bearings permit inspection or cleaning of motor windings without exposing interior of bearing to dirt.
- Access covers are secured by easy-operating, self-locking fasteners for ready removal.

Get details — Call your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin. Ask for Bulletin 05R8183.



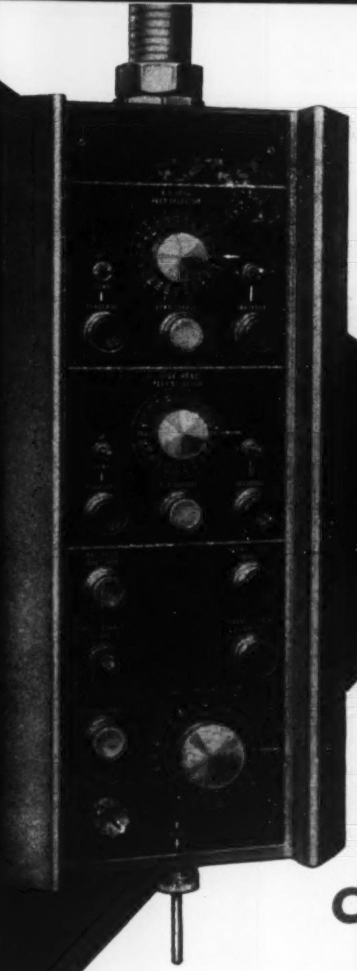
Note accessibility offered by generous size opening covers. Upper half of end shield is removable for entrance to motor winding.

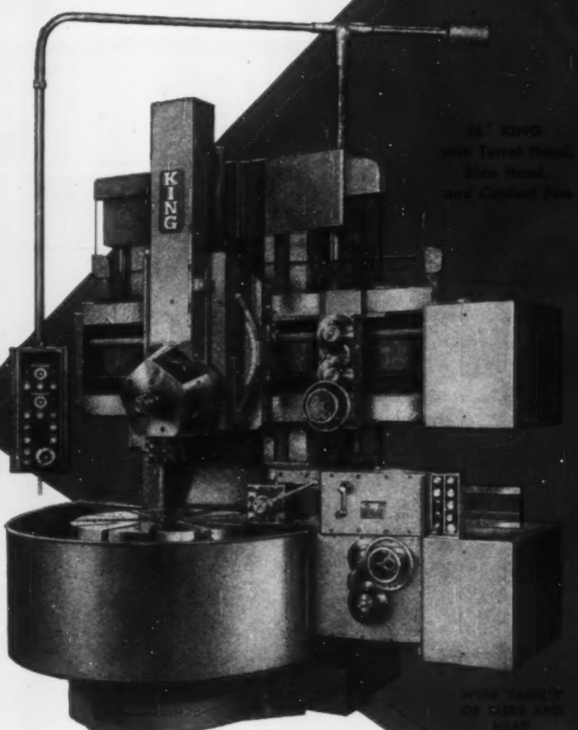


A-C
ALLIS-CHALMERS

ALLIS-CHALMERS

A-4847





36" KING
with Turret Head,
Side Head,
and Coolant Pan

WIDE VARIETY
OF SIZES AND
HEAD
COMBINATIONS

Complete Electrical Controls on the all new KING speed set-up and production time

ALL CONTROLS CONVENIENT TO OPERATOR

LOCATED ON PENDANT—

Feed and rapid traverse movements
— and —
Pre-selective feed selection from direct-reading dials:

for rail heads on machines with two heads on rail . . . for rail head and side head on machines with one head on rail.

Power swiveling of rail heads

Pre-selective speed selection from direct-reading dial

Speed change • Turret index • Table stop

LOCATED ON SIDE HEAD PANEL—

Feed and rapid traverse movements of side head
— and —
Pre-selective side head feed selection from direct-reading dial:
on machines with two heads on rail.

Main drive • Rail positioning • Coolant pump

Thread cutting and taper turning selection for all heads

New KING® Vertical Boring & Turning Machines incorporate highly advanced, complete electrical controls to give you faster production at lower costs. Controls, listed at left, are conveniently located on movable pendant station and fixed side head panel.

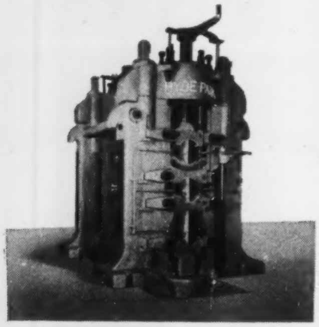
Controls are not the whole story, of course—the All New KING has many other important production-boosting features. Horsepower has been increased to 40 to 50 H. P. on 30", 36", and 46" sizes; 75 to 100 H. P. on sizes 56" and up. Spindle drive provides 24 speeds in any one of three standard ranges: high, intermediate, or low. 24 feeds from .0016" to .250" per revolution are available. Complete drive transmission is mounted in an extra-rugged housing, assuring increased stability. Entire drive is removable as a unit.

Among other outstanding features are . . . new spindle and spindle mounting providing maximum table stability . . . automatic lubrication of all moving parts . . . anti-backlash nuts for all cross-feed movements. Machine is adapted for simple optional addition of: automatic positioning of heads, automatic tracing control of heads, automatic cycling, power rail clamping, power indexing of turrets. For full details see your authorized King Distributor, or write us direct.

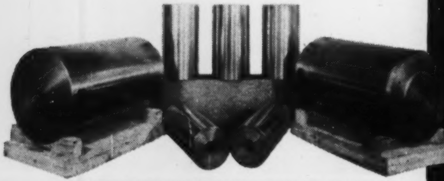
AMERICAN STEEL FOUNDRIES, KING MACHINE TOOL DIVISION
1150 TENNESSEE AVENUE, CINCINNATI 29, OHIO

KING Vertical Boring and Turning Machines

STRETCHER LEVELLER



18" 3 Hi BAR MILL



CHILLED IRON HYDRAULIC RAMS

Rolls and Rolling Mill Equipment...

For over half a century Hyde Park has built only the best. The name HYDE PARK on a Roll or on a piece of Rolling Mill Equipment is our guarantee of quality, and your assurance of high performance. Our engineers will be glad to work with you on any special roll or rolling mill equipment.

A "RED CIRCLE" ROLL FOR EVERY PURPOSE

Alloy Iron Rolls . . Grain Rolls . . Chilled Rolls . . Nickel Chilled Rolls . . Moly Rolls . . Cold Rolls . . Sand Rolls.

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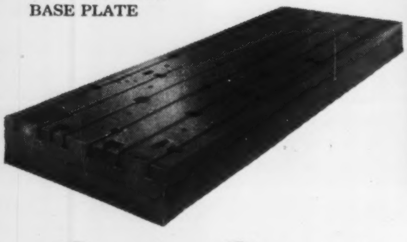
GRAY IRON CASTINGS UP TO 80,000 LBS.

RED CIRCLE Rolls ALLOY-CHILLED

MACHINE TOOL
BASE PLATE



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HYDE PARK, WESTMORELAND COUNTY, PITTSBURGH DISTRICT, PA.

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with over 12,000 tons per day production —— 40 years reserve tonnage, originating on the Chesapeake & Ohio, Norfolk & Western, and Virginian railways

ARE DISTRIBUTED BY ONE EXCLUSIVE SALES AGENT

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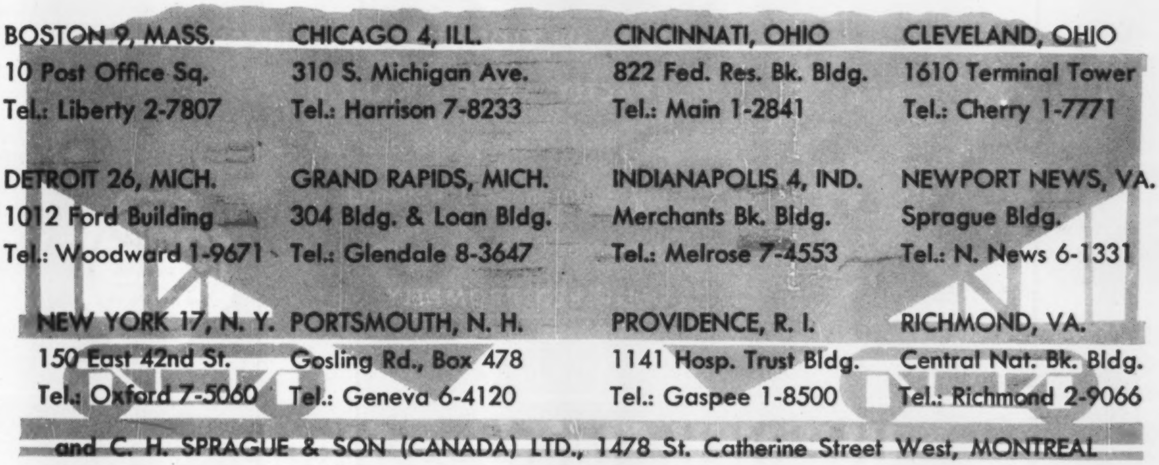

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Merchandisers of Quality Bituminous Coal since 1870

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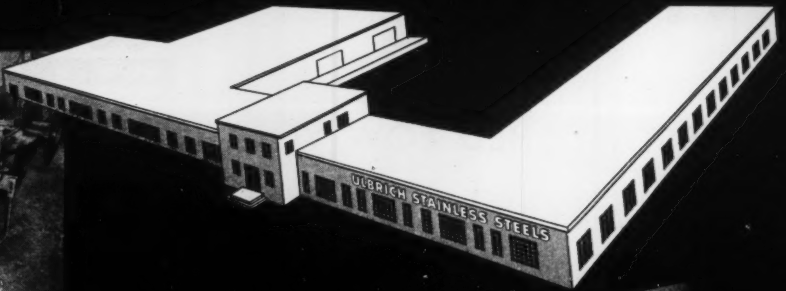
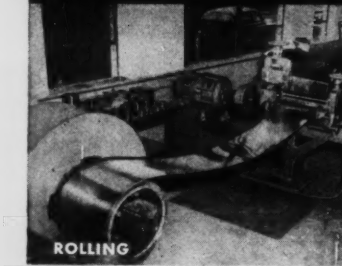
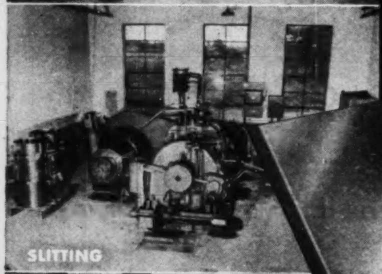
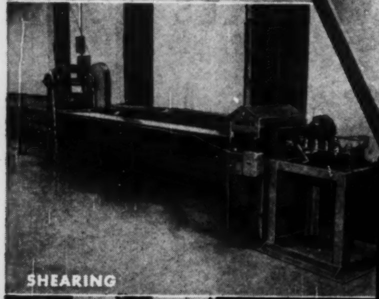
the biggest little mill in the country




ROLLING


SLITTING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With more facilities than ever before
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TO YOUR CLOSEST REQUIREMENTS—
EXACTLY AS YOU WANT IT.
One foot or one pound and up
rolled, slit, sheared, flattened,
edge rolled, annealed and
DELIVERED PROMPTLY.

Certified
ANALYSIS
can be given
on any Ulbrich
material.

ULBRICH Stainless Steels

Established 1924
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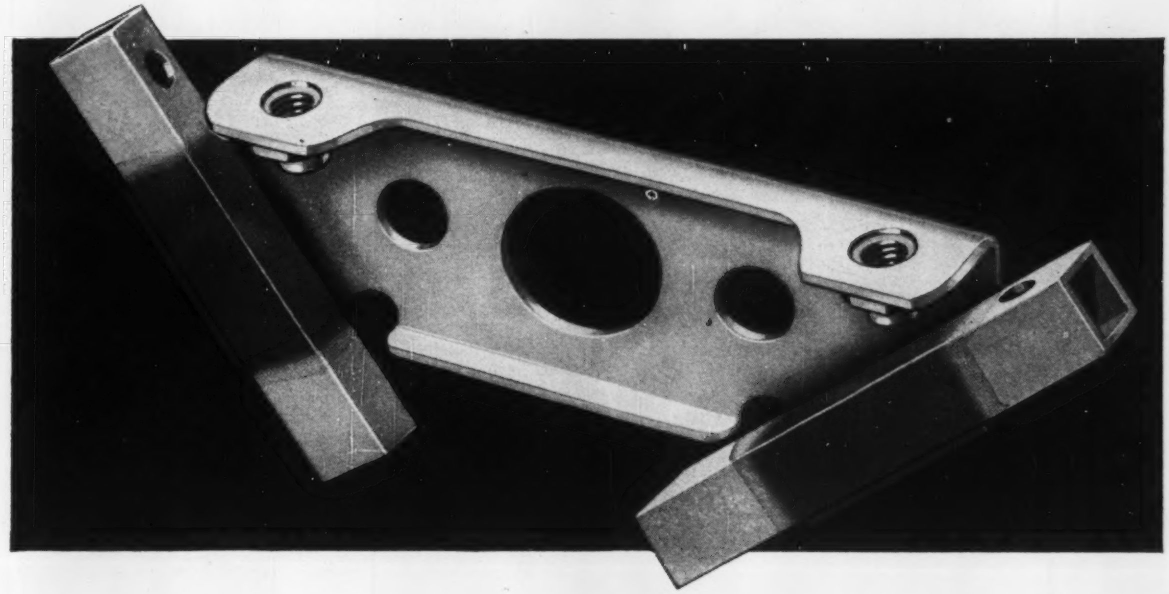
Jack & Heintz Saves $\$15^{84}$ Per Hour...

with TOCCO* *Induction Brazing*



Brazing Costs Down—When Jack & Heintz engineers switched from torch brazing to automatic induction, brazing cost of these inverter brush mounts fell from \$.05 to \$.006 each—a reduction of 83% in direct labor costs alone! Additional savings result because less cleaning is required after TOCCO, and fuel costs are much lower, too.

Brazing Production Up—While costs dropped, production on the part zoomed—from 40 to 360 brazed assemblies per hour. Furthermore, rejects and scrap, formerly high, are now negligible.

Versatility--The part shown is just one of over 25 parts, large and small, which alert J & H engineers have converted from old-fashioned brazing methods to modern, automatic TOCCO. Overall brazing costs (TOCCO brazing versus former methods used) are down 75%—brazing speed, up 100%.

If the manufacture of your product involves brazing, heat-treating, forging or melting of ferrous or non-ferrous metals, don't overlook TOCCO as a sound method of increasing produotion, improving product quality and slashing costs.

TOCCO

JUST PUSH A BUTTON

THE OHIO CRANKSHAFT COMPANY

Mail Coupon Today — **NEW FREE Bulletin**

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Please send copy of "Typical Results of TOCCO Induction Brazing and Soldering".

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CLEARING
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To Keep Your Product Quality High, Specify

YOUNGSTOWN SHEETS AND STRIP

This modern production line is busy turning out high quality steel stampings for electric range tops. To help maintain their excellent reputation for quality work, this progressive concern relys on Youngstown Sheets and Strip—the best drawing and stamping steel obtainable anywhere.

Youngstown's half-century of steelmaking know-how guarantees you a blend of the right combination of tensile strength, surface finish and ductility to provide top-production runs of even the most difficult-to-form work.

Satisfied users tell us they get increased production, fewer rejects, faster and more accurate forming, together with lower fabrication and die costs. Why not get the same advantages by making Youngstown Sheets and Strip your specification? They are quality-controlled through every steelworking, rolling and annealing operations to meet your most exacting requirements.

Contact our nearest District Office, today, for additional information or metallurgical assistance—or write directly to our Home Office.

QUALITY
YOUNGSTOWN
SERVICE

**COLD ROLLED
SHEETS
AND STRIP**

**THE
Youngstown
SHEET AND TUBE COMPANY**
General Offices - Youngstown 1, Ohio
District Sales Offices in Principal Cities

Producers of Quality Carbon and Alloy Steels for Over Half-a-Century

These are the Hot Rolled or Cold Finished

Quality Stainless Steel Bars

Available From

Rotary

thickness
1/8" through 3/8"
legs
3/4" through 3"
angles

1/4" through 4"
squares

1/4" through 4 1/2"
rounds

1/4" through 3 1/8"
hexes

bar flats on application

Stainless steel bars within indicated size ranges are being produced for inventory to facilitate prompt deliveries.

Long experience in the production of stainless steels makes Rotary your best source of supply. Close control of quality goes hand in hand with better service for you at Rotary Electric Steel.

STAINLESS BILLETS FOR FORGING IN COMPLETE SIZE RANGES

Rotary Electric Steel Co.

P.O. BOX 4606 • DETROIT 34, MICHIGAN

ALLOY and
STAINLESS STEELS
BILLETS • SLABS
HOT ROLLED and
COLD FINISHED BARS

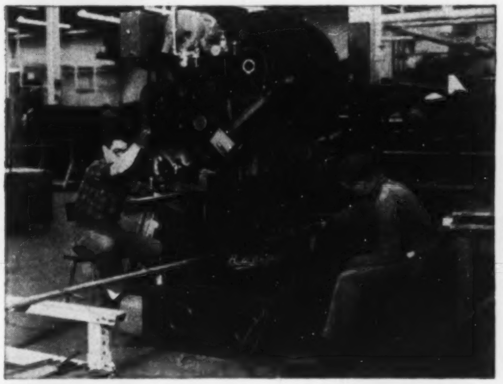
SALES OFFICES—Chicago, Ill. • Cleveland, Ohio • Newark, N.J.

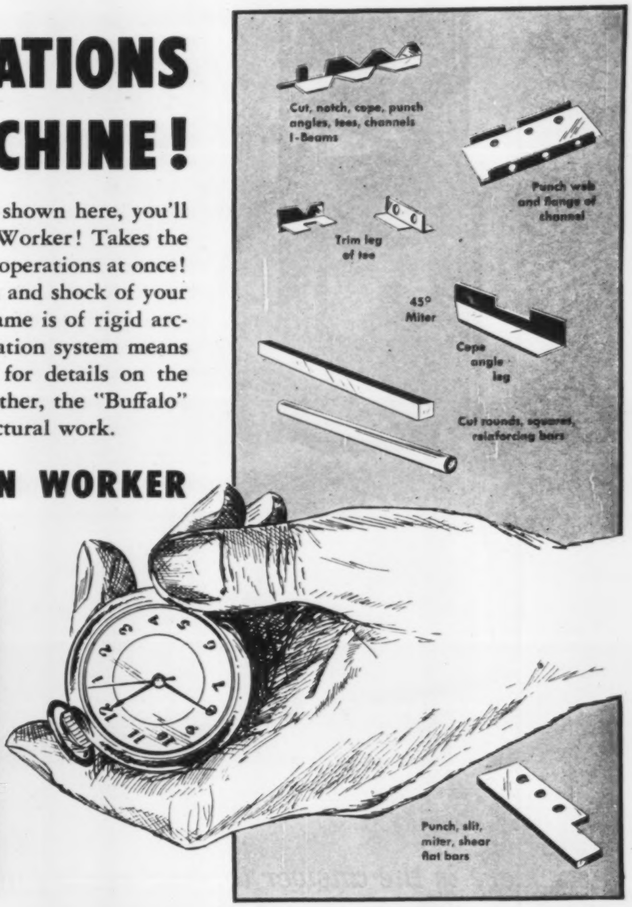
SALES AGENTS—Indianapolis, Ind. • Fayetteville, N.Y.

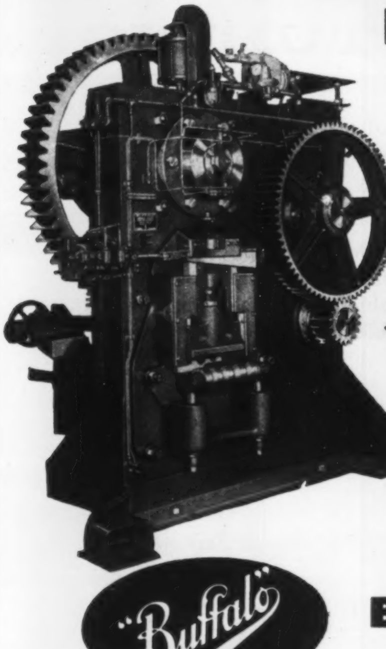
ALL THESE OPERATIONS ON ONE FAST MACHINE!

If your shop does two or more of the operations shown here, you'll be money ahead with a "Buffalo" Universal Iron Worker! Takes the space of one machine, does the work of six — two operations at once! No tool changes required. Built to take the strain and shock of your heaviest production or maintenance work, the frame is of rigid arc-welded heavy steel plate, and the one-shot lubrication system means minimum maintenance. Write for Bulletin 360 for details on the "Buffalo" Universal Iron Worker and its big brother, the "Buffalo" Unistructural Iron Worker for your heaviest structural work.

"BUFFALO" UNIVERSAL IRON WORKER



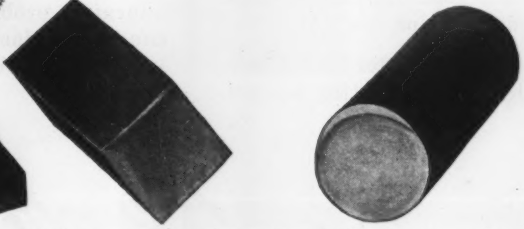

Cut, notch, cope, punch angles, tees, channels I-Beams
Punch web and flange of channel
Trim leg of tee
45° Miter
Cope angle leg
Cut rounds, squares, reinforcing bars
Punch, slit, miter, shear flat bars



RAPID, CLEAN BILLET SHEARING!

"Buffalo" Billet Shears are saving money for forging shops by their high-speed dividing of round and square billets with clean, square cuts. Because the "shearing" is actually a straight *fracture,* there is no "smearing" to conceal possible porosity, as with burning or sawing — resulting in better inspection. 11 sizes to handle up to 10" rounds and 9" squares at 6 strokes per minute — correspondingly higher speeds in the smaller sizes.

Write today for Bulletin 3295-C.



"BUFFALO" BILLET SHEARS

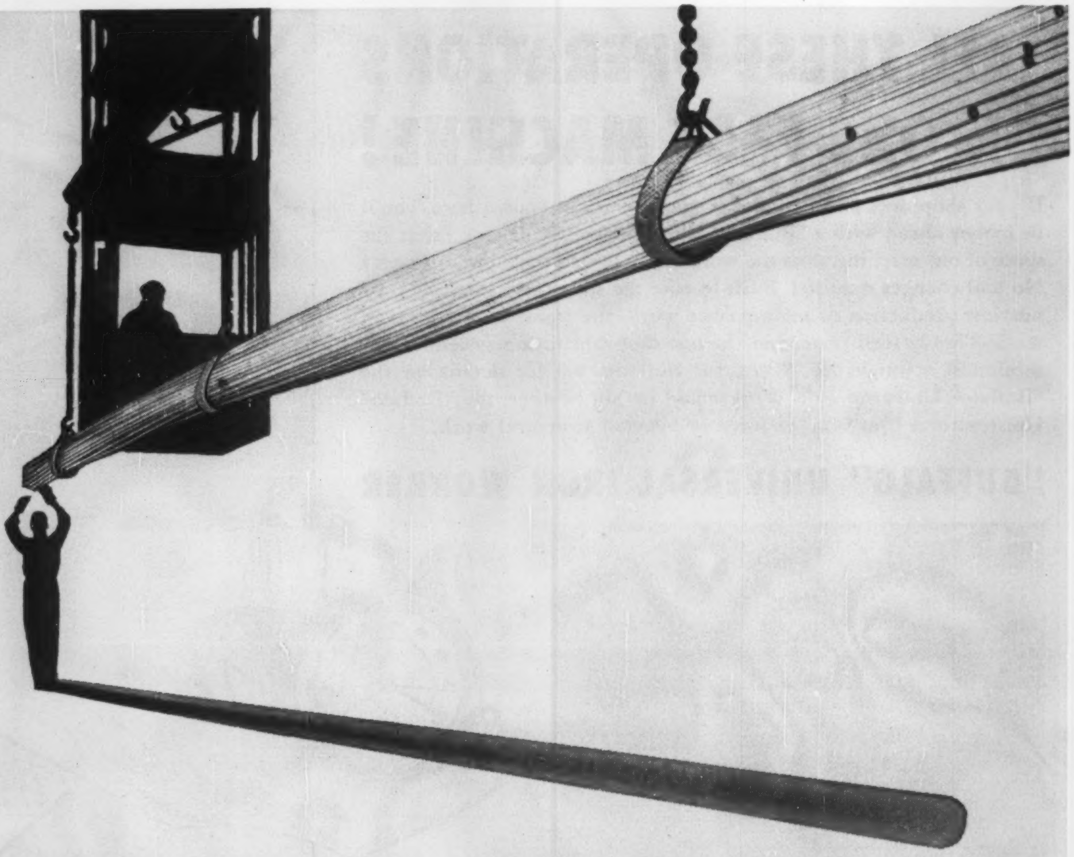
"Buffalo"

BUFFALO FORGE COMPANY

158 MORTIMER STREET BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING PUNCHING SHEARING BENDING



Here is the answer to your needs for **EXTRA LONG**

SEAMLESS STEEL TUBING

Pacific Tube Company can now supply you with precision, cold-drawn Seamless Steel Tubing in absolutely straight lengths up to 58 feet long. Special new equipment, including new pickling tanks 60 feet long makes this feat possible. The longest draw bench in the country helps, too!

For your protection and better tubing, new high-pressure hydrostatic testing is used.

A wide range of sizes is quickly available in many chemistries in Stainless, Seamless Carbon and Alloy Tubing... cold-drawn to your exact specifications.

If you are faced with an application or metallurgical problem, our engineering staff can be of valuable assistance... just let us know your problem.

Pacific also manufactures...
COLD-DRAWN BARS
GROUND & POLISHED SHAFTING
Precision drawn to rigid specifications from 3/16" thru 3½" in many chemistries including Ledloy Grades A & B.

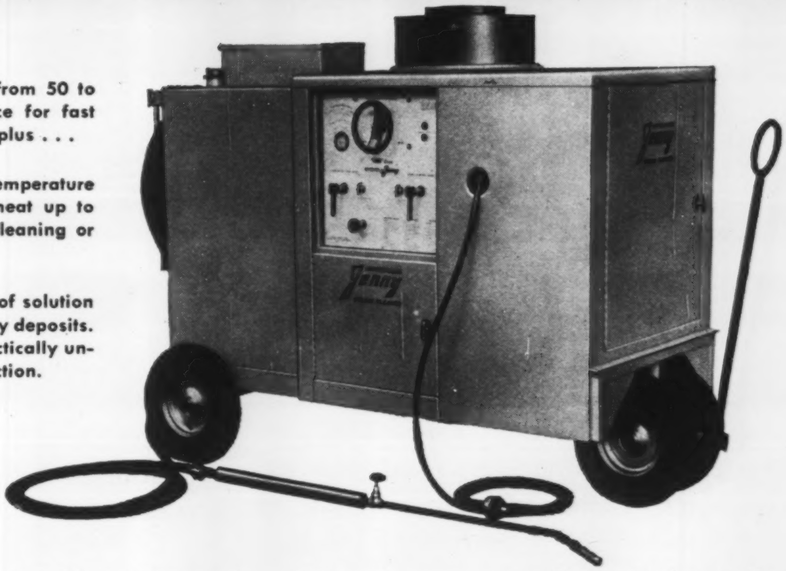
Pacific
TUBE COMPANY

5710 Smithway St., Los Angeles 22, Cal.

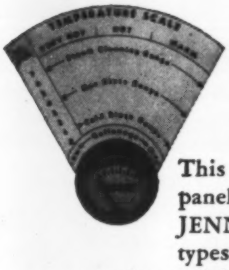
MANUFACTURERS OF SEAMLESS STEEL TUBES • BAR STOCK • GROUND & POLISHED SHAFTING

LOOK At The Wide Choice of Cleaning Actions You Get With

NEW SERIES "4000" HYPRESSURE Jenny



- Choice of any pressure from 50 to 450 pounds—plenty of force for fast removal of grease and dirt; plus . . .
- Any desired solution temperature from cold to boiling hot — heat up to 325°F., to assure thorough cleaning or sanitation; plus . . .
- As much as 400 gallons of solution per hour to quickly carry away deposits. In combination they give practically unlimited choice of cleaning action.



This scale, reproduced from the control panel of a New Series "4000" Hypressure JENNY indicates the many different types of cleaning action which are instantly available with this new high pressure cleaner. From the valve settings on the control panel you can actually see the type of cleaning action you are getting; and the possible combinations of heat, pressure, and solution strength are limited only by your needs.

Whether your problem is one of blasting hardened mud or clay from earth-moving or construction equipment . . . removing dirt and grease from vehicles, machinery, parts or floors . . . cleaning for overhaul or repainting . . . or thoroughly deodorizing and sanitizing, Series "4000" is the perfect answer.

The time and money Series "4000" Hypressure JENNY can save in maintenance of machinery or equipment will interest you. For full details, without obligation . . .

MAIL THE COUPON TODAY

Please send full information on

☐ Hypressure Jenny ☐ Jobber Time Payment Plan

Name____________________

Title____________________

Company____________________

Address____________________

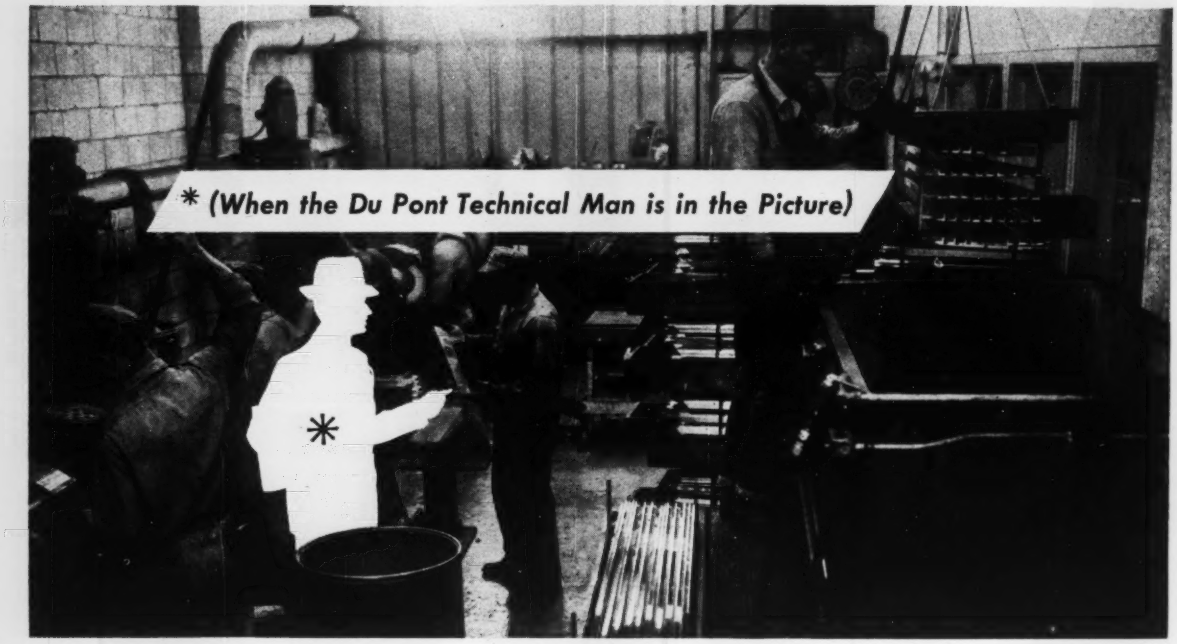
City____________ State____________

HYPRESSURE JENNY DIVISION

HOMESTEAD
VALVE MANUFACTURING COMPANY
"Serving Since 1892"

P. O. Box 22 Coraopolis, Pa.

You Get Practical Help on Vapor Degreasing of Metals



** (When the Du Pont Technical Man is in the Picture)*

Your Du Pont technical man and your distributor for "Triclene" D trichlorethylene are but a phone call away when you need fast, practical help in vapor degreasing.

The broad experience of the Du Pont Technical Representative and the skill and facilities of Du Pont research and laboratories assure you of the finest in technical help. The Du Pont technical man's job is to help you keep your vapor degreasing at top efficiency—whether a complete analysis of your operation is required, or a quick solution to an immediate problem.

Call him direct, or ask your distributor of "Triclene" D for his services. They're yours for the asking. E. I. du Pont de Nemours & Co. (Inc.), Electrochemicals Dept., Wilmington 98, Delaware.

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

Technical Representatives at Your Call

*** In New England**
W. Sparkes, Boston, Mass., HAncock 6-1714

*** In Metropolitan New York**
A. L. Denkewalter, New York, N. Y., LOngacre 3-6440

*** In Upstate New York**
E. H. Traub, New York, N. Y., LOngacre 3-6440

*** In Philadelphia**
J. E. Goodridge, Philadelphia, Pa., MIdway 9-1420

*** In Cleveland**
V. J. Zaffke, Cleveland, Ohio, CHerry 1-6078

*** In Cincinnati**
J. D. Nelles, Cincinnati, Ohio, PArkway 1-5253

*** In Detroit**
J. J. Hargarten, Detroit, Michigan, UNiversity 4-1963
K. B. Fish, Detroit, Michigan, UNiversity 4-1963

*** In Chicago**
R. L. McKeown, Chicago, Illinois, INdependence 3-7250
C. W. Burkemper, Chicago, Illinois, INdependence 3-7250

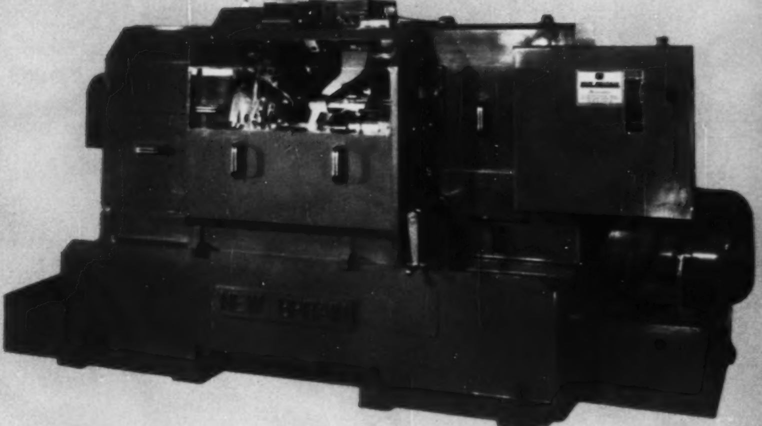
*** In the Southwest**
J. G. McKernan, Dallas, Texas, VIctor 2517

*** On the West Coast**
G. W. Davis, San Francisco, California, EXbrook 2-6230
R. J. Dent, El Monte, California, CUmb. 3-2761

In the South
O. S. McCullers, Charlotte, N. C., FRanklin 5-5561

WHEREVER YOU TURN
on multi-spindle bar machines
NEW BRITAIN HAS THE MACHINE FOR YOU

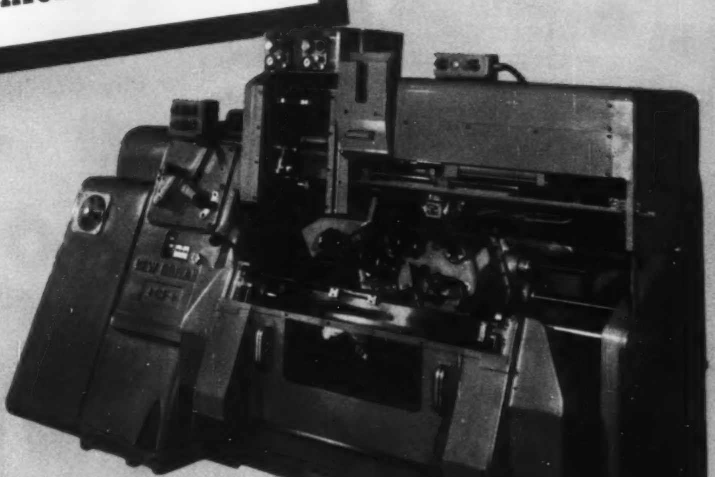
THE NEW BRITAIN MACHINE CO.
Model 62
Automatic Bar
Machine
NB



The new Model 62 New Britain bar machine has an independent radial cross slide in every position — opening new possibilities for effective tooling. New Britain "accuracy features" include spindle carrier lifting to eliminate wear during index, plus rigid locking of the carrier during the cutting cycle. Magazine loading available if desired.

WHEREVER YOU TURN
long or short runs
NEW BRITAIN HAS THE MACHINE FOR YOU

THE NEW BRITAIN MACHINE CO.
Model 11/70
New Britain +GF+
Copying Lathe
NB

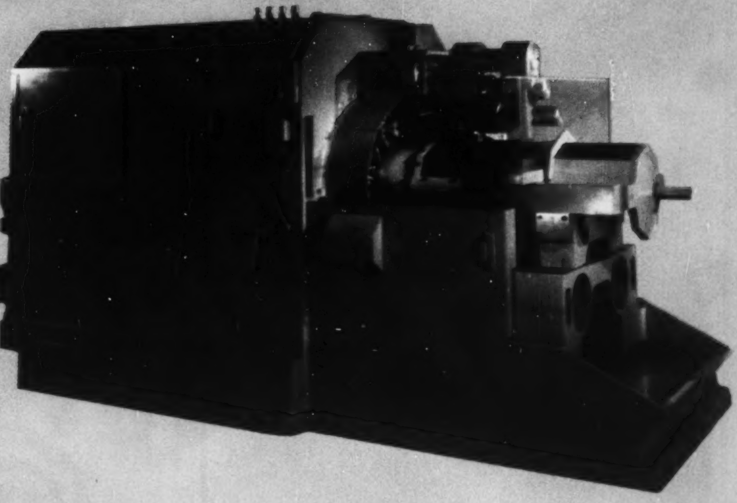


The original New Britain **+GF+** copying lathe has grown into an extensive line, to meet the demand for the wide variety of applications for its better copy-turning principle. Regardless of length of run or the variety of pieces you make, you can use the New Britain **+GF+** profitably. Basic advantages are: fast setup, inexpensive tooling, elimination of the chip problem, minimum operator fatigue, and dimensional accuracy with good surface finish to reduce grinding allowances. Optional features include automatic re-cycling, automatic loading and ejecting.

WHEREVER YOU TURN
castings, forgings or pressed metal pieces
NEW BRITAIN HAS THE MACHINE FOR YOU

THE NEW BRITAIN MACHINE CO.
Model 810
Automatic
Chucking Machine
NB

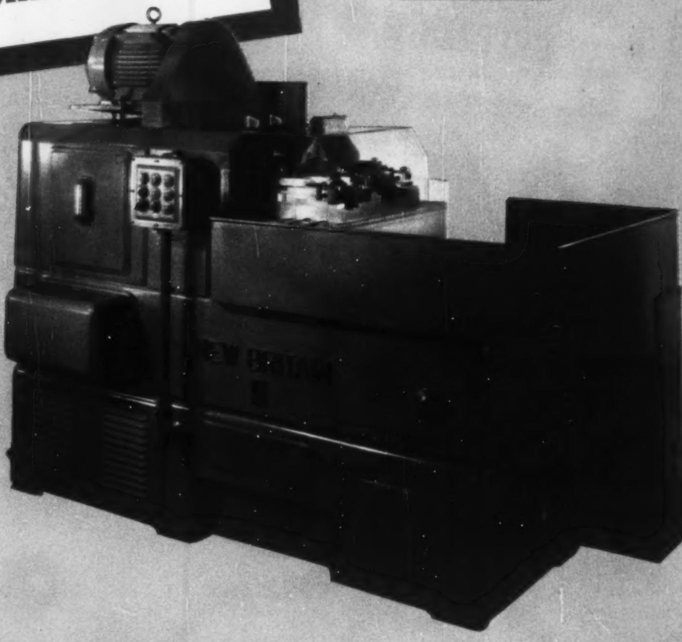
Versatility, accessibility, quick setup and sustained high production of precision parts are what you look for in an automatic chucker. New Britains are famous for these features all over the world. Perhaps you are also thinking of the possible savings which automatic loading, unloading and automatic gauging could effect. If so, you will want to learn about the imaginative use of automated production which New Britain engineers are applying to chucker work these days. You can now handle bigger pieces than ever on New Britains too — up to fifteen inches in diameter.

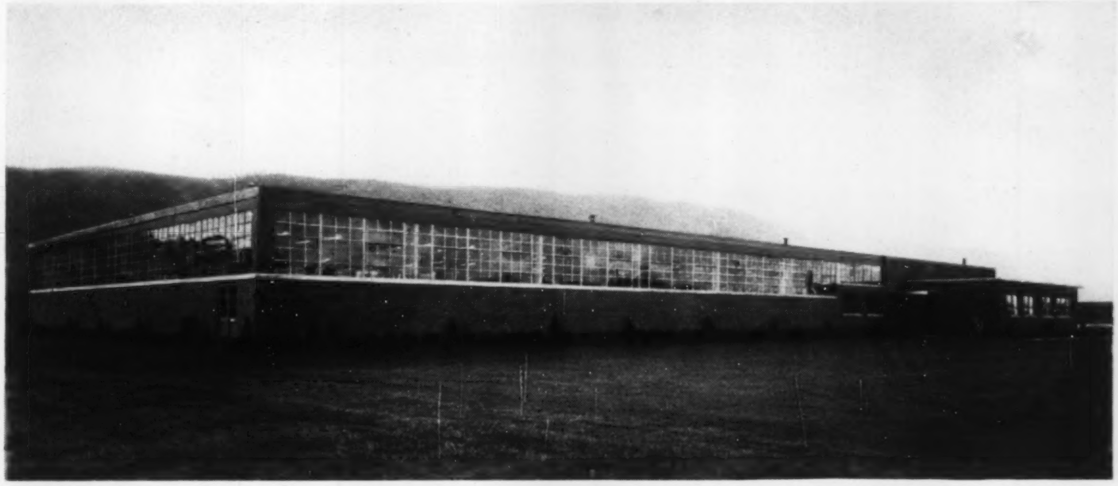


WHEREVER YOU TURN
or bore precision contour work
NEW BRITAIN HAS THE MACHINE FOR YOU

THE NEW BRITAIN MACHINE CO.
Model 37
Precision Boring
Machine
NB

New Britain precision straight and contour boring machines provide a new approach to machining parts that would be problem pieces on any other type of equipment. These simple, fast, accurate machines require minimum attention and utilize inexpensive single point tools. They make the most profitable use of automatic loading, gauging and tool adjustment where these features fit the job requirements. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.





"We have had the good fortune to locate where our new employees, and the entire community, displayed a spirit of helpfulness that made our transition as simple as possible"... the experience of Steelex Corporation at their new Williamsport, Pennsylvania plant.

THERE MUST BE A REASON...

Steelex Corporation Planted its Entire Facilities

IN PENNSYLVANIA

Birger Engzell, President of Steelex Corporation, tells why his company moved its entire office and factory, for the manufacture of quality stainless steel products, from Brooklyn, New York, to Williamsport, *Pennsylvania*. Here, *in Mr. Engzell's own words*, are the principal reasons:

1. "An 'Industrial Park' location which provides all utilities, off-street employee parking, and room for expansion.
2. "A new 21,000 square foot, one-story plant *constructed to our own specifications by the Williamsport Community organization at a cost of only $6.25 per square foot*—available to us on a long-term lease.
3. "A shorter supply route for our raw material, stainless steel.
4. "A good distribution center, through common carriers, for our merchandise—components for jet engines; ammunition parts; stainless steel tumblers, pails and shakers; and equipment for restaurants, hotels, hospitals, dairies and laboratories.
5. "A satisfactory labor market, providing skilled personnel for a variety of operations."

Your company can benefit by these and similar advantages offered in many *Pennsylvania* communities. The Pennsylvania Department of Commerce will prepare a confidential survey, "*custom-tailored*" *to your individual requirements*, which will tell you more about how Pennsylvania fits in with your new plant plans.

For details, write or call—

Pennsylvania Department of Commerce
Main Capitol Building, 397 State Street
Harrisburg, Pennsylvania
Phone: CEdar 4-2912

Special reports and tabulations, tailored to your specific location requirements, will be prepared upon request by engineering and economics specialists, covering:

Labor—Availability, skills, rates, surplus areas.

Markets—Consumer, industrial product, state, regional.

Transportation—Water, rail, truck, air transit time, costs.

Building—Availability, sizes, location, descriptions.

Sites—Acreage, topography, utility services, photos, maps; industrial districts.

Financing—Community-state industrial building program, lease-purchase, commercial credit.

Materials—Metals, industrial chemicals, wood, textiles, farm products.

Minerals—Location, reserves, potentials, analyses.

Water—Quantitative, qualitative analyses.

Power—Capacity, network, industrial services, costs.

Fuel—Coal, oil, natural gas service, costs.

Engineering—Schools, enrollment, specialization, research laboratories, services.

Taxes—Inter-state and community comparisons, assessment ratios, millages, corporate.

Communities—Characteristics, size, regions, housing, schools, culture, recreation.

Industrial Representatives Available for Inspection Tours, Conferences and Consultations

Easy does it. At tagging station on Alaskan beach, a member of U. S. Fish & Wildlife Service steadies a three-month-old seal pup while companion attaches a corrosion-resisting Monel alloy tag to left flipper. Tagging permits tracing of seal migrations to various parts of the world, aids in scientific studies of growth, mortality, homing instinct and other characteristics.

Tagged...for future reference

This little seal may be planning a trip far from his Alaskan home. But of course he can't tell the U.S. Fish & Wildlife Service what his destination is!

As they're very much interested in finding out, they tag him.

Migratory habits of seals have been under observance for many years. In all that time, there was one thing that always stumped the Wildlife Service—marking a seal so that he *stayed* marked.

They tried everything they could think of. Clipping...shearing...branding...painting. Nothing worked. When they tried metal tags, that brought up still another problem.

What metal would stand the abuse? What would resist corrosion from salt water? What would be hard enough to resist abrasion when seals clamber over rocks and sand?

Finally, a metal was found—Monel* nickel-copper alloy!

With Monel, it makes no difference if seals frolic in the salty sea. Or flip-flop around on shore. Or travel from Alaska to Japan, as many of them have! Monel alloy tags proved rugged enough to take this punishment. Some, in fact, remained in good condition *after 12 years on a seal's flipper.*

Do you have a problem involving metals? One in which corrosion, abrasion, high or low temperatures, stresses, or fatigue are causing trouble? Look into the Inco Nickel Alloys. Properties are described in a helpful booklet: *Standard Alloys for Special Problems.* Illustrated with more than 40 case histories. Write *now* for a copy. The International Nickel Company, Inc., 67 Wall Street, New York 5, N. Y.

*Registered trademark

INCO TRADE MARK

INTERNATIONAL NICKEL

Nickel Alloys Perform Better, Longer

STEEL

January 7, 1957

Metalworking Outlook

Business Climate for 1957

Most of the major economic indicators point upward for 1957. Samples: The Federal Reserve Board's industrial production index (1947-1949 = 100) should average 147 or 148 in the next 12 months, compared with 143 in 1956 and 139 in 1955. The gross national product should hit $430 billion in 1957, compared with $411 billion in 1956 and $391 billion in 1955. New plant and equipment spending should reach $39 billion in the coming year, compared with $35 billion in 1956 and $29 billion in 1955. Prices are going to rise an average 2 to 3 per cent (a little more in metalworking) and profits should be better than in either 1955 or 1956. The coming year should see handsome results in greater efficiency as a result of heavy capital outlays in the past.

Possible Dark Spots

Are there dark spots in that glaringly bright picture? Possibly. If inventory build-ups are excessive or if sales curves for capital goods flatten out in the next 12 months, 1957 could be tagged in economic history books as the top-out period in a cycle that turned upward in late 1954. War scares could give a hysterical tone to inventory expansion which is going on now in a fairly orderly way. Although order backlogs in most capital goods are still high, watch out for slippage. Note, too, that the 1957-vs.-1956 improvements predicted in the FRB, GNP and capital spending indicators are all less spectacular than the 1956 gains over those of the previous year.

Metalworking Sales: $145 Billion

But if buying policies continue calm and if backlogs remain satisfactory for capital goods, we'll have another excellent year. Metalworking sales should reach $145 billion, compared with $135 billion last year and $128 billion in 1955. Steel ingot production should be about 120 million tons, compared with 115 million last year. Steel will follow the general metalworking profile for 1957—good first, second and fourth quarters, with a seasonal sag in the third. No major labor outbursts should mar the calm of the year.

Industry-By-Industry Prospects

Steel-consuming industries should fare about this way:

CONSTRUCTION—Dollar volume will conservatively reach $46.6 billion for the year, may even go as high as $48 billion. That compares with $44.5 billion last year. The federal highway program, industrial expan-

Forum on Technical Progress—p. 217   *Market Outlook—p. 483*

sion, the President's public school program and the vital need for increased sewer and water facilities will swell the totals. Residential building will hover around 1 million units, the lowest since 1951.

AUTOMOBILES—Look for 6.8 million cars and 1.1 million trucks to be built this year. Sales of 1957 models have started well. Dealers can't get enough of some models, and used cars in the yards continue to be the lowest in about four years.

TRANSPORTATION EQUIPMENT—Some 72,000 freight cars will be built in the next 12 months, compared with 64,000 in 1956. More track work than last year will also help boost total spending. Shipbuilding will be decidedly up, but it still is relatively minor in our economy. Look for about 700,000 gross tons to be built. Aircraft business will also increase because of added defense spending. Sales will exceed $8.2 billion in 1957, compared with $8 billion last year.

APPLIANCES—They'll chalk up factory unit sales 5 to 10 per cent higher this year than last. The staple appliances (refrigerators, stoves) will gain moderately, but the real growth will come in newer ones like dryers, dish washers and room air conditioners.

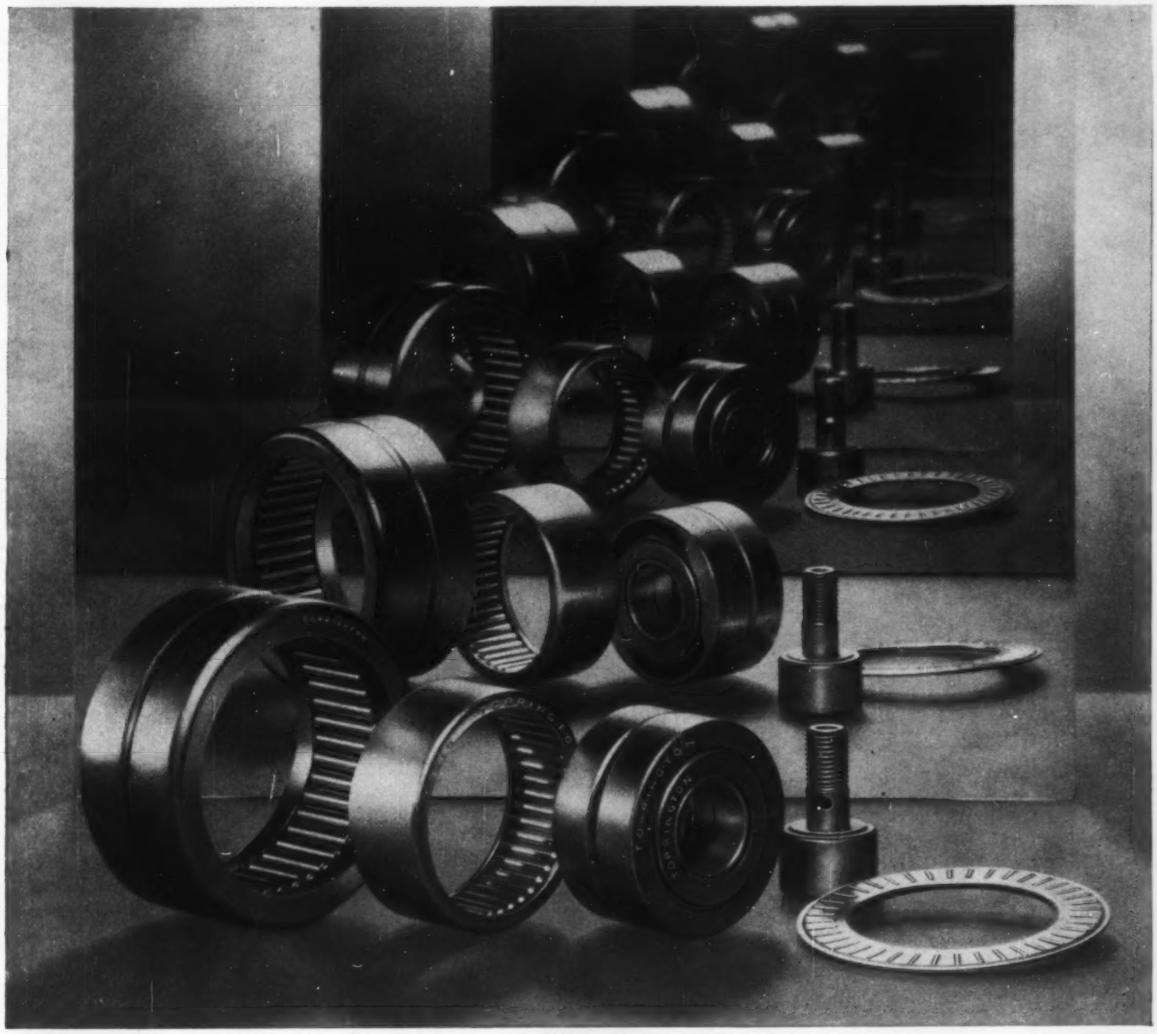
MACHINERY—Machine tool shipments in '57 should equal or slightly exceed the $885 million delivered last year. Order backlogs are holding at about seven months. Other types of machinery will do as well or better: Material handling equipment sales should rise 10 per cent over 1956's. Tool and die shipments of $1 billion last year should be equaled in '57. Industrial gas equipment sales in the next 12 months should match the 1956 total. Construction machinery volume will pass $2 billion in '57 because of the road program.

ELECTRICAL MACHINERY—Another good year is ahead, even better than in general machinery. Especially bright are prospects for generating equipment and electronics. In electronics, look for an $11 billion volume this year, compared with $10.3 billion last year and $9.7 billion in 1955.

FARM EQUIPMENT—The upturn can come in '57; sales can be as much as 8 per cent better than last year. The replacement market is especially promising. Farm income is rising.

OIL AND GAS EQUIPMENT—Industry's capacity is the sole limit here. Some 60,000 new wells will be drilled in the year, compared with 57,000 in '56.

CONTAINERS—A steady 4 per cent growth is likely in the coming year. Of all the types of containers, drums alone will probably not quite achieve the average improvement.



For new perspectives in **NEEDLE BEARING** *design and performance*

...*look* to Torrington, pioneer in the development of every type of precision Needle Bearings.

Using carefully selected quality steels, and the most modern manufacturing methods, Torrington has developed a complete range of types and sizes of Needle Bearings for every use. There are special designs for rotation, for oscillation, even thrust applications! There are aircraft types, cam followers, and heavy duty types. Yet their unit cost is low, bringing anti-friction performance with economy.

Precision manufacture and the full complement of rollers that provides maximum radial capacity in minimum cross section make Torrington Needle Bearings top performers in the most rugged applications.

Little wonder their use has spread to countless applications in every field with outstanding success. Have you considered them for your product? Send for further information today.

THE TORRINGTON COMPANY
Torrington, Conn. • South Bend 21, Ind.

TORRINGTON BEARINGS

Needle • Spherical Roller • Tapered Roller • Cylindrical Roller • Ball • Needle Rollers

In Hotel Statler, New York City...

ARMCO ZINCGRIP STEEL GUARDS CONDUITS WHERE MAINTENANCE MEN CAN'T GO

Production of conduits requires severe lock seaming, but the zinc coating on Armco ZINCGRIP Steel stays tight and unbroken. That's why conduits like this one are expected to last the life of the air conditioning system—even where inaccessible to maintenance men.

Miles of conduits and ductwork are required in the modern air conditioning system that serves 2,200 rooms of the giant hotel.

Conduits for the new air conditioning system in New York City's Hotel Statler are made of Armco ZINCGRIP® Steel. According to the project engineer in charge, this is why:

"The galvanized bond of Armco ZINCGRIP Steel is completely reliable. We can lock-seam without causing damage to the coating. This means that *conduits can be placed in inaccessible parts of the building* . . . in vertical rises between floors for example, without further attention for an indefinite period. *They'll last the life of the system itself.*" And further . . .

"In those areas where conduits are exposed, their attractive appearance does not detract from the residential nature of the hotel."

20-YEAR RECORD

For more than 20 years, drawn and severely formed parts of many kinds of products have been made of Armco ZINCGRIP Steel at cost savings.

The reasons:

1. No flaking or peeling of the patented hot-dip coating.
2. Elimination of finishing after fabrication.
3. Production advantages of ZINCGRIP coils.

Many years of experience in hundreds of plants back up this fact: *Anything that can be done with sheet steel can be done with Armco* ZINCGRIP.

ARMCO STEEL CORPORATION

ARMCO ®

817 Curtis Street, Middletown, Ohio • Sheffield Steel Division • Armco Drainage & Metal Products, Inc. • The Armco International Corporation

January 7, 1957

Our Pledge for 1957

As the New Year gets under way we would like to give you an idea of how we hope to serve you in 1957. This is the setting:

On the whole, 1957 is expected to be the best year we've ever had. (See forecast, page 127.) The second half is expected to be better than the first, contrary to off-the-cuff predictions of a downturn.

The government's tight money policy, needed to prevent the boom from getting out of hand, will discourage plant expansion and modernization. Yet foresighted management knows it must build today for the expanding markets of the 1960s and 1970s. (See Metalworking's Fabulous Future, page 123).

Labor is mapping out its campaign for still higher wages, more fringe benefits and a shorter work week. Management will be forced to study the revolution in technology (see Technological Progress, page 217) as it strives to satisfy its workers and hold down unit production costs at the same time. Management, too, will want to learn more about getting along with its workers.

Markets are continually on the move. Management needs to be constantly vigilant—or a product with a market today may be replaced by the better product of a competitor tomorrow.

Competition, despite prosperity, has never been sharper. Prices of materials are on the rise. Management needs to know its costs in relation to selling prices or risk the possibility of red ink, even bankruptcy.

At best, the job ahead will be complex. And with this complexity will come the need for better communication. You will need to know more about what is going on and what is taking shape. As we see it, this is the job for the editors of STEEL—to report and interpret this information in terms of what it means to you and your company.

And we won't stop there. As a matter of policy, we will not dwell on the past. Our emphasis will be on the future.

We shall try to do the job interestingly, graphically and with enough warmth and excitement to stimulate your thinking.

That is our pledge for 1957.

Irwin H. Such
EDITOR-IN-CHIEF

More Than

100,000
Washer Dies at Your Disposal

In the purchase of special washers to meet your specific requirements, an important item of initial expense is *die cost.* In addition, the time factor that enters into the designing and building of special dies to conform to your blue prints can prove costly in terms of curtailed production of the equipment on which the washers are to be used.

Here at our Milwaukee Wrot Washer Plant we have available what we honestly believe to be the world's largest inventory of Washer Dies . . . *more than 100,000 different* dies covering almost every conceivable type of washer. These dies, accumulated over a period of 68 years, are at your disposal *without cost* . . . ready for immediate production of washers in all classifications covered by this methodically indexed die inventory.

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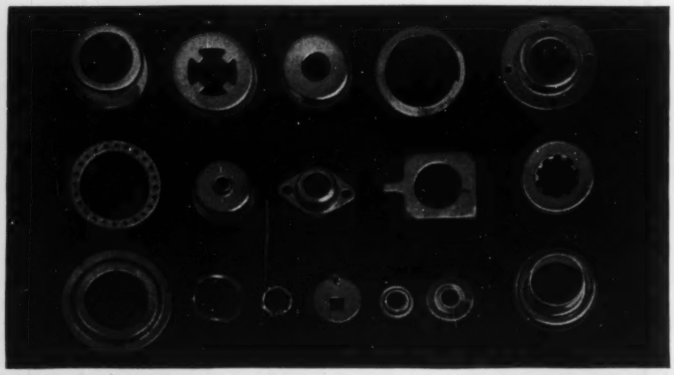

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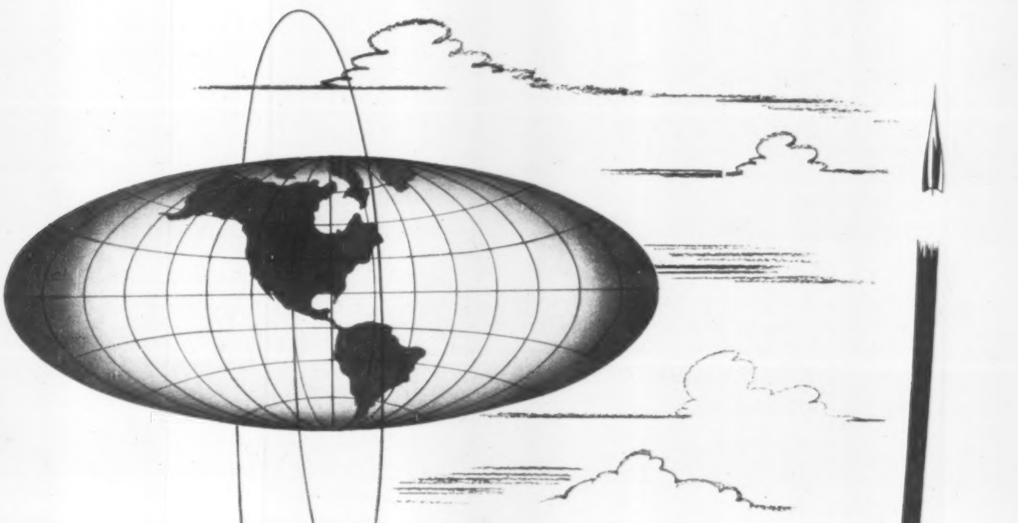


Get Set for Metalworking's Fabulous Future

LAST AUTUMN the Editors of STEEL brewed a presentation called "Metalworking's Fabulous Future." It was based on facts, laced with projections and sprinkled with fantasy. We thought it potent but potable.

We savored it with a little awe. Although we had tested the ingredients carefully, the results were a little stronger than we had expected. They were so exhilarating that we felt a gnawing anxiety. Were we thinking too big?

We offered the presentation before a number of audiences throughout the U.S. They contained some of the country's top thinkers. Their reaction was that if the presentation had a fault, it was that it was too conservative. In some areas, we found the top authorities were ahead of us in their thinking and projecting.

The future for metalworking appeared to be even more fabulous than we had thought.

Consider these conclusions:

Sales Volume To Triple

By 1975, metalworking sales will reach $372 billion, in terms of constant dollars. That compares with $135 billion in 1956.

The figure is, of course, a projection. It is based in part on population estimates which indicate we will have 221 million people by 1975. More people, and more families, mean larger markets and a larger overall economy. It is largely on the expanding population that projections of a larger national product are based.

In metalworking, there is another factor. Each year per capita consumption of the products of metalworking is increasing. For the postwar years, this increased consumption, in terms of constant dollars, amounts to $41 each year for every man, woman and child.

If the per capita consumption trend continues (and there are good reasons to expect that

it will), and if the population estimates are correct, metalworking sales should triple in the next two decades.

Fantastic? Not in the light of past performance. Over the last two decades, metalworking sales, in terms of constant dollars, have quadrupled. In unadjusted dollars, they have increased eightfold.

The conclusion is inevitable: Metalworking sales will increase at a faster rate than the gross national product. That, too, is in line with past performance. Since 1937, the gross national product, in unadjusted dollars, has increased only fivefold, compared with eightfold for metalworking.

Already easily the country's greatest industry, metalworking enjoyed a sales volume last year which was greater than that of the next five largest industries combined: Food and beverages, petroleum and coal products, chemicals, lumber and furniture, and textiles.

If metalworking's volume of $135 billion could be converted into silver dollars, there would be enough to pave the Ohio Turnpike, the Pennsylvania Turnpike, the New Jersey Turnpike and the New York Thruway. Those left over would surface many of the turnpikes that will be built in the future.

Technology on the Move

The relatively faster growth of metalworking stems from technological developments that are making products available in a variety and quantity that would have been considered impossible two decades ago.

Look at two of the more spectacular: Atomics and electronics. The energy released by the atom and controlled by the electron will do more to stimulate the growth of metalworking over the next 20 years than anything to date. Together, they will dwarf the industrial revolutions brought about by steam and electricity.

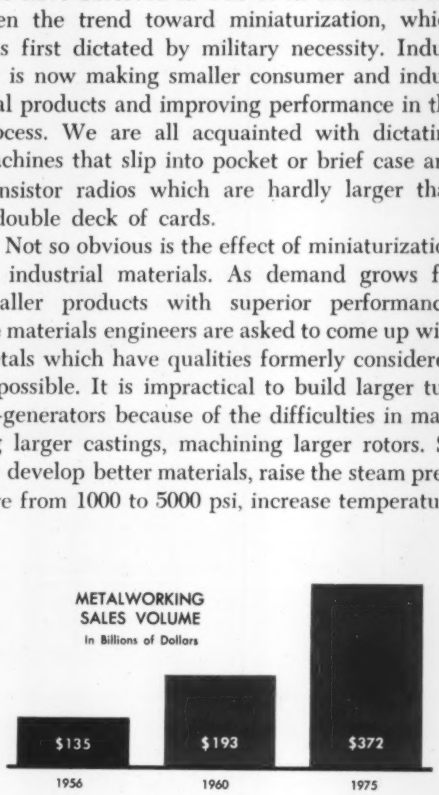
Atomic business is galloping ahead much faster than even the most optimistic expected. Spending by industry and government for nuclear research and development (including plants and equipment) will reach $5 billion annually in the early 1960s. By comparison, the railroads and the mining industry spent only $1.8 billion for plant and equipment in 1955.

Within two decades, half the new electric power installations will be atomic, predicts Ralph Cordiner, General Electric president. He also thinks we will use conventional energy fuels in ever increasing amounts.

Smaller and Better

The skyrocketing growth of the electronic industry during the postwar period amazes all who have observed it. One of its influences has been the trend toward miniaturization, which was first dictated by military necessity. Industry is now making smaller consumer and industrial products and improving performance in the process. We are all acquainted with dictating machines that slip into pocket or brief case and transistor radios which are hardly larger than a double deck of cards.

Not so obvious is the effect of miniaturization on industrial materials. As demand grows for smaller products with superior performance, the materials engineers are asked to come up with metals which have qualities formerly considered impossible. It is impractical to build larger turbo-generators because of the difficulties in making larger castings, machining larger rotors. So we develop better materials, raise the steam pressure from 1000 to 5000 psi, increase temperature to 1200°F and build a smaller turbine that produces more kilowatts from less fuel.



The new materials and processes required by and being developed for use in atomic installations, in electronic equipment, for missiles and heat-barrier probing aircraft and other spectacular developments are making possible better products for consumer and industrial uses.

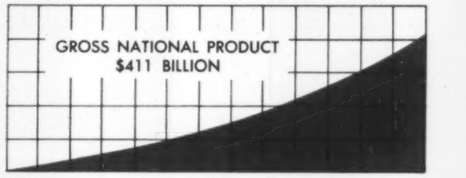
The alloy or cermet developed in the search for a missile material may fall short of requirements for its intended use. But it provides a dandy material for the turbine power plant for your 1965 automobile. All along the line we're developing new lubricants, new seals, new gaskets. We're learning a lot more about design so that the by-products of the missile program, the supersonic aircraft programs, the atomic power program are perhaps many times more valuable than the prime product itself.

Clear Road Ahead

As far as technology is concerned, the road ahead is clear. We can make anything we want to make.

For the first time in man's history, we have won the battle over material want. We can produce what we need.

We no longer worry overmuch about shortages of raw materials. In the new technology, materials that were critically short as recently as World War II are being by-passed. We make the materials we need with alternate substances. The modern metallurgist is becoming a genius at achieving a synergistic effect: He is able to add two and two and get eight.



The promise of the new technology is great. But the realization of that promise will not be automatic. To achieve it will require effective utilization of our human resources, money, physical plant and time. That will be the challenge to metalworking management over the next several decades.

Build Better Managers

As the metalworking industry climbs the expansion slope, it will need more managers. Some thoughtful industrialists believe our greatest shortage in the years ahead will not be the scarcity of engineers, or machines or materials. They think it will be a shortage of managers who can effectively combine material and human resources to make the products of our fabulous future.

One reason for the wave of mergers among metalworking companies has been weakness in management, particularly management in depth, in the acquired company. Others today are facing a brutally clear decision: Build better managers or be merged.

Building better managers will become more and more a do-it-yourself project for individual companies. As the trend toward deferred and fringe compensation continues, it will become increasingly difficult to lure managers away from your competitors. An active management development program will become a must for every company. It will range from the selection, care and feeding of junior executives to the grooming of middle management men for higher responsibilities.

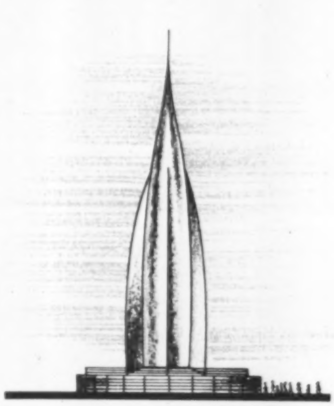
Motivating Men

During the last two decades, management lost ground to the unions in dealing with its employees. As the unions moved in, management tended to move back. To many, unionism has become a mote in the eye. They see their workers not as individuals, but merely as members of a collective bargaining group.

To a degree, that has been caused by militant unionism, supported by a federal government which often has been prounion and antibusiness. Laws still on the books restrict the freedom of management in its relationship with employees.

The time is coming for management to recapture its leadership.

The new technology, including automation, will tend to replace the unskilled worker with the highly skilled. The skilled man will tend to become a professional or semiprofessional worker. That may start a trend toward the obsolescence of unionism.

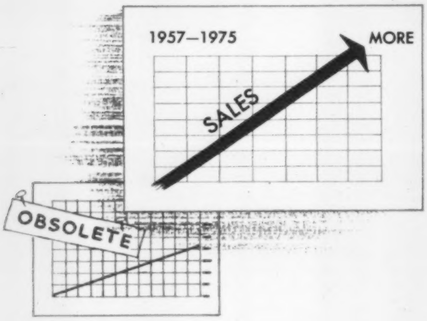


Watch for more workers to be taken into partnership through some form of profit sharing.

Inventory Engineering

Just as a company that poorly engineers its product is in trouble, so is the firm that poorly engineers its inventory of materials and parts that go into that product.

Today, more special and technical training are required to know when to and when not to stockpile, how to inventory to keep production lines running smoothly, how to stock so that costs are minimized and even how to merely keep track of what you have. Inventory management must become more scientific, just as marketing, production and other phases of company operations are becoming in our increasingly complex economy.



Producing for the New Technology

Many of the products of metalworking today were unheard of two decades ago. Such progress will continue. The metalworking manager who is to hold or improve his position must learn how to produce for the new technology. Otherwise, he may be in the position of the buggy whip manufacturer who refused to change his product.

The change may be rapid. Tomorrow's managers will have to keep a business eye cocked on new technological development, move into production at the right time.

One question which will continue important: Should the prime producer make his own parts and components or buy them from subcontractors? For others, the question will be: Is it better to get into prime production or be a subcontractor?

Research on the Move

It's estimated that American industry has spent $45 billion for research since 1860. Twenty-five billion dollars has been spent since 1950, and annual expenditures now are running at a rate of $5 billion to $6 billion.

Continued acceleration of basic and applied research will be required to achieve metalworking's fabulous future.

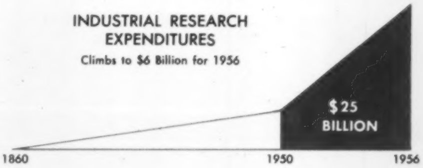
The management and direction of such substantial expenditures, particularly for the other than giant corporations and the government, will be a relatively new problem for many managers.

Sales Planning

Automation will be a certain factor in metalworking's fabulous future. But before we can have widespread automation, we will need many innovations in marketing. Otherwise, we will soon become bankrupt.

In the new technology, we no longer can afford wide economic fluctuations. We will have to develop markets that are predictable.

Economist Peter Drucker suggests that to apply automation to the production of household appliances might well mean the manufacturer would not sell appliances at all. He would offer the housewife a service policy for five years and supply the appliances on loan or at a nominal rent. At the end of that period, he would replace the used appliance with a new one, automatically creating a predictable, constant market.



That and other possibilities in marketing will be explored in the years ahead.

Problems of Prosperity

These, we believe, will be some of the problems metalworking management will face in its march toward a fabulous future. The Editors of STEEL will explore those problems and suggest some procedures in this publication's Program for Management—1957.

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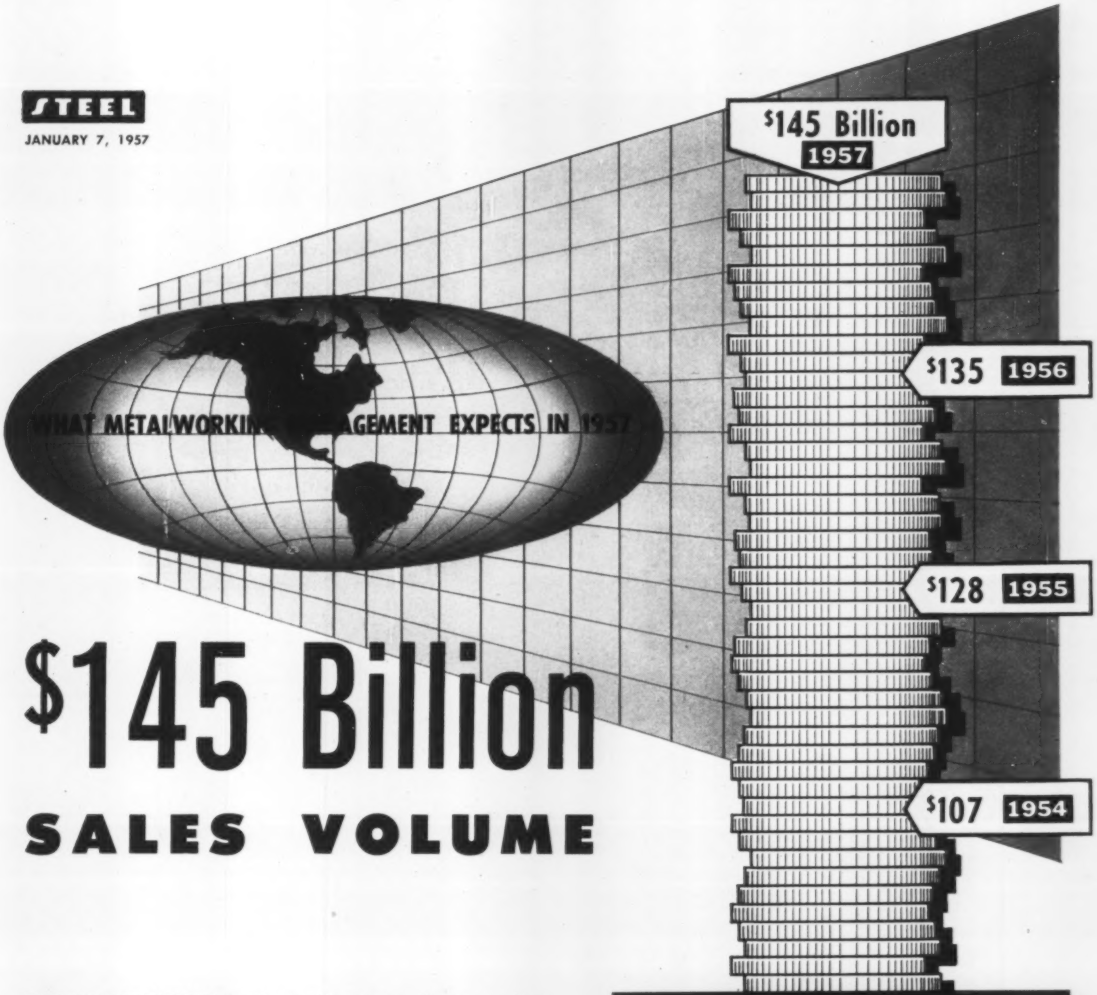
STEEL
JANUARY 7, 1957



$145 Billion
SALES VOLUME

METALWORKING, with another record year under its belt, will continue to move upward in sales and production in 1957. Sales volume this year will be nearly 8 per cent above the 1956 figure. Half will result from increased physical output, half from increased prices.

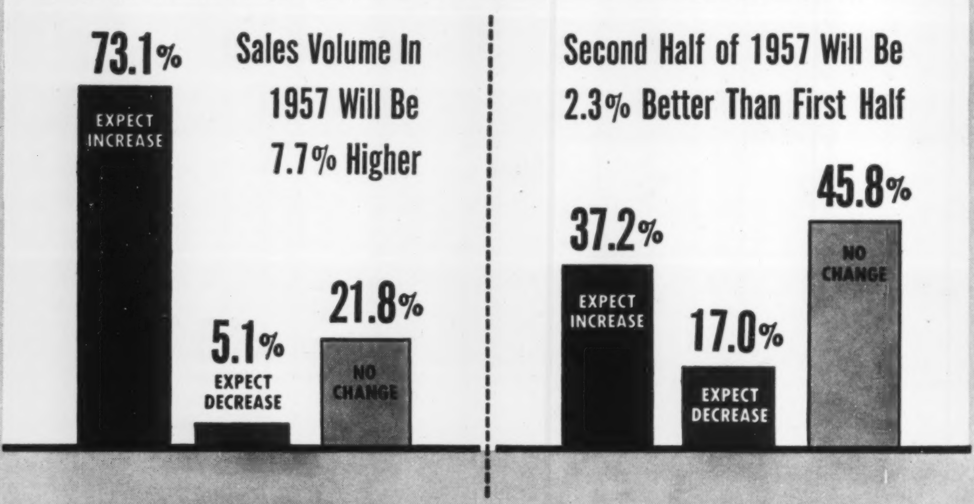
Employment, manufacturing and distribution costs will advance moderately. Expansion will continue on a substantial scale, although at a slightly slower rate than last year's because of the tight money policy and completion of some programs.

Expenditures for research will be higher as the industry broadens its technological advance toward a fabulous future.

Best Predictors—Those predictions are based on what managers of metalworking plants expect to do this year. The Editors of this publication long have believed that the best indicator of the business trend in metalworking is what the men who manage the companies believe it will be. Experience has shown this to be true.

At the end of World War II, STEEL's respondents contradicted the prophets of depression and said we were heading into a postwar expansion. They

- Sales Will Continue To Climb
- Tight Money To Slow Expansion
- Employment Will Be Higher
- Skilled Help Will Be Scarcer
- Selling Prices Will Rise
- Costs Will Continue Upward
- Research Spending Will Rise
- More New Products Will Appear
- Marketing Will Get Attention



CHANGES EXPECTED IN SALES VOLUME DURING 1957

Analysis by Size of Plants	Increases Expected in 1957	Second Half Compared to First Half
Plants Employing 20-99	8.0%	+2.6%
Plants Employing 100-499	7.3%	+2.1%
Plants Employing 500 or more	6.9%	+1.5%
By Major Industry Groups		
S.I.C. 33—Primary Metals	5.7%	+1.8%
S.I.C. 34—Fabricated Metal Products	7.6%	+2.7%
S.I.C. 35—Machinery (except electrical)	7.2%	+1.7%
S.I.C. 36—Electrical Machinery	12.4%	+2.8%
S.I.C. 37—Transportation	8.0%	+1.9%
S.I.C. 38—Instruments, Related Products	8.8%	+4.5%
Other Metalworking Groups*	6.5%	+3.3%

*S.I.C. 19, 25 and 39.

were right. In late 1953, metalworking managers foresaw the adjustment of 1954, but predicted it would be milder than what most economists had in mind. In late 1954, they said metalworking sales would snap back. They did. A year ago, they predicted record metalworking sales in 1956.

Metalworking sales in 1956 totaled $135 billion, despite a five-week steel strike and a poorer than expected performance by the automotive industry. Machinery, electrical equipment, other transportation and fabricated metal products exceeded expectations.

In this year's survey, STEEL asked 7500 general managers how they think their plants will fare over the next 12 months.

Hold Your Hat—Three of four respondents say

DEFENSE WORK will account for 12.7% of all metalworking production

	1957	1956
No defense work	44.0%	48.3%
Less than 25%	39.2%	37.0%
25-50%	7.2%	5.0%
50-75%	5.2%	5.4%
More than 75%	4.4%	4.3%

their dollar sales volume will climb. Only one in 20 expects a drop below last year's level.

They expect dollar volume to rise 7.7 per cent to a total of $145 billion in 1957. That would be twice the gross national product of 1935. It would be more than double metalworking sales for any year from the end of World War II up to 1950.

Good Second Half—The managers say the increase will persist right through the year, that the second half will be better than the first.

Sparks—Most optimistic are the managers of plants producing electrical machinery and equipment. They expect their sales volume to jump 12.4 per cent over the 1956 mark. Indicated dollar volume will be in excess of $23 billion. Makers of instruments and related products see an 8.8 per cent increase to a dollar volume of $3.9 billion. Transportation equipment producers expect to snap back with an 8 per cent increase to $41.2 billion. Fabricated metal producers believe their sales will rise 7.6 per cent to $18.9 billion. Machinery, other than electrical, will advance 7.2 per cent to

SKILLED WORKER OUTLOOK

32.4% EXPECT SHORTAGE

UNIT WAGE COSTS

82.6% EXPECT INCREASE

5.6% EXPECT DECREASE

11.8% EXPECT NO CHANGE

FACTORS AFFECTING COSTS:

	Per Cent of Plants*
More Overtime	15.7
Less Overtime	3.3
Higher Wage Rates	61.0
Higher Productivity	12.9
Lower Wage Rates	0.1
Lower Productivity	3.1
Other	3.9

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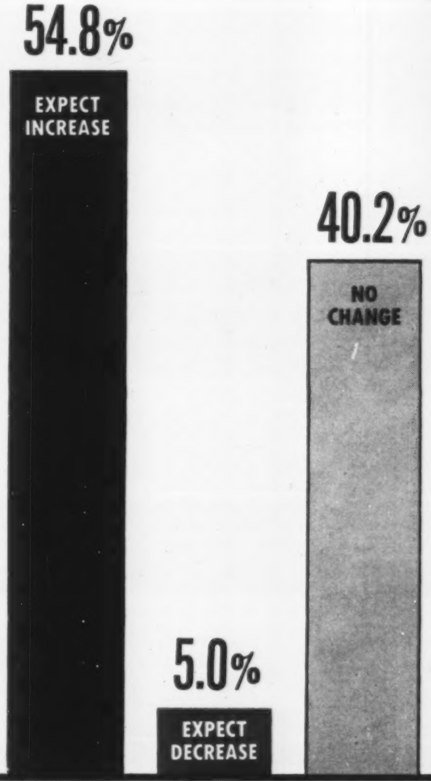
*Figures add to more than 100% because many plants checked more than one factor.

Employment Will Rise 4.0%



Analysis by Size of Plants	INCREASE EXPECTED
Plants Employing 20-99	4.2%
Plants Employing 100-499	3.8%
Plants Employing 500 or more	3.0%
By Major Industry Groups	
S.I.C. 33—Primary Metals	3.3%
S.I.C. 34—Fabricated Metal Products	3.4%
S.I.C. 35—Machinery (except electrical)	4.2%
S.I.C. 36—Electrical Machinery	5.9%
S.I.C. 37—Transportation	4.3%
S.I.C. 38—Instruments, Related Products	5.7%
Other Metalworking Groups*	2.6%

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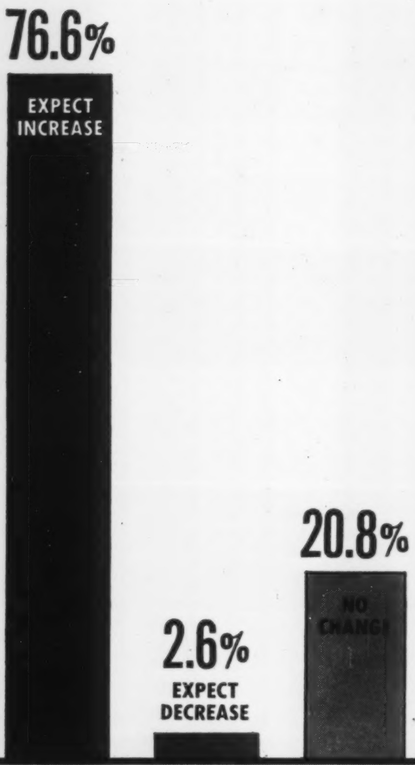
*S.I.C. 19, 25 and 39.

SELLING PRICES
Up 3.9%



an indicated $28 billion. Producers of primary metals predict a conservative 5.7 per cent gain over a $30 billion total.

Smaller Plants Happy — Greatest increases in volume are expected by the small and medium size plants, although the spread in expectations is only about 1 per cent.

But little plants still have their troubles. The tight money policy appears to be pinching them more than it does the larger companies. Shortages of materials also are a greater problem to the small plants. They also believe the larger plants have an advantage in obtaining engineers and other technicians.

Prices—Expect no runaway inflation in metalworking during 1957, although prices will edge upward. The weighted average increase is expected to be 3.9 per cent and will account for about half the increase in dollar sales volume. A year ago, metalworking managers predicted a 5 per cent increase in selling prices during 1956.

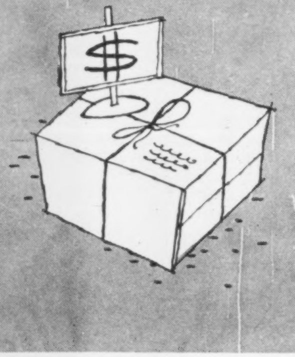
It is believed that competition and improved efficiency resulting from new equipment coming into production this year will slow down inflation.

Manufacturing Costs—The unit cost of manufacturing is expected to rise 3.4 per cent, reflecting higher labor and material costs. Material costs will be offset to some extent by more automatic equipment.

Sales and distribution costs will edge up 2.5 per cent.

More for Research—Two of five managers expect to increase their budgets for product research. Over-all, they will spend nearly 5 per cent more dollars on research than they did last year.

Greater expenditures for product research will result in the introduction of new products by three of five companies. Many of the new products



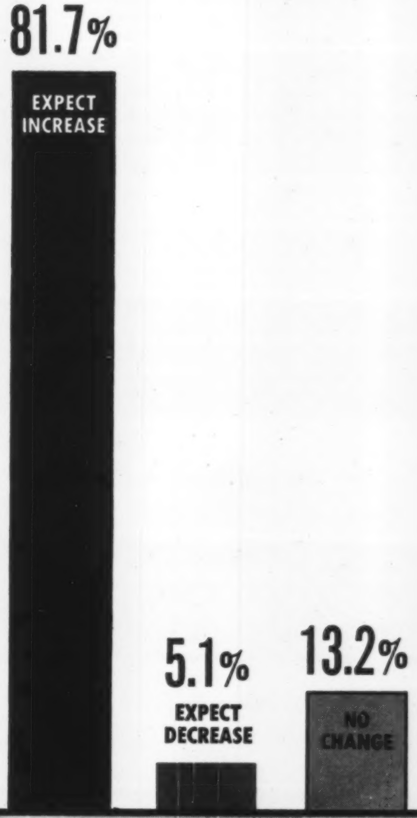
INCREASES EXPECTED
By Major Industry Groups

	INCREASE EXPECTED
S.I.C. 33—Primary Metals	3.5%
S.I.C. 34—Fabricated Metal Products	3.9%
S.I.C. 35—Machinery (except electrical)	4.5%
S.I.C. 36—Electrical Machinery	2.9%
S.I.C. 37—Transportation	4.0%
S.I.C. 38—Instruments, Related Products	3.0%
Other Metalworking Groups*	3.5%

*S.I.C. 19, 25 and 39.

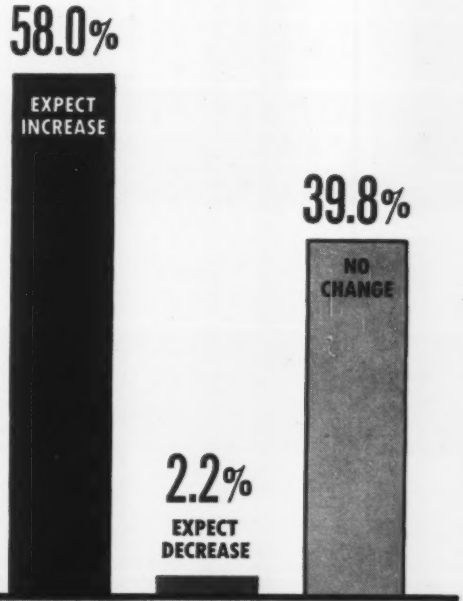
UNIT COST OF MANUFACTURING

Up 3.4%



SALES AND DISTRIBUTION COSTS

Up 2.5%



INCREASES EXPECTED
By Major Industry Groups

	UNIT COST OF MANUFACTURING	SALES & DISTRIBUTION COSTS
S.I.C. 33—Primary Metals	3.5%	2.0%
S.I.C. 34—Fabricated Metal Products	3.2%	3.1%
S.I.C. 35—Machinery (except electrical)	3.4%	2.5%
S.I.C. 36—Electrical Machinery	3.0%	2.3%
S.I.C. 37—Transportation	3.7%	1.6%
S.I.C. 38—Instruments, Related Products	3.1%	2.6%
Other Metalworking Groups*	3.9%	2.0%

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*S.I.C. 19, 25 and 39.

51.5%
OF ALL
PLANTS
EXPECT
TO
INCREASE
THEIR
CAPACITY

Capacity Is Expected To Expand 5.6%

Of These →

	15.0% WILL BUILD NEW PLANTS	**39.9%** WILL BUILD ADDITIONS	**82.1%** WILL BUY EQUIPMENT	**5.6%** NET INCREASE
Analysis by Size of Plants				
Plants Employing 20-99	13.2%	34.1%	83.8%	5.4%
Plants Employing 100-499	15.8%	45.4%	79.4%	6.2%
Plants Employing 500 or more	21.2%	50.9%	81.3%	5.5%
By Major Industry Groups				
S.I.C. 33—Primary Metals	11.2%	44.7%	83.7%	4.6%
S.I.C. 34—Fabricated Metal Products	15.3%	37.6%	76.8%	3.5%
S.I.C. 35—Machinery (except electrical)	10.9%	38.4%	87.5%	6.6%
S.I.C. 36—Electrical Machinery	29.0%	43.5%	71.5%	11.1%
S.I.C. 37—Transportation	15.7%	46.2%	90.7%	5.7%
S.I.C. 38—Instruments, Related Products	29.2%	37.3%	86.2%	8.7%
Other Metalworking Groups*	7.8%	38.8%	80.9%	2.8%

*S.I.C. 19, 25 and 39.

which will get into large-scale production this year were unknown at the end of World War II.

Marketing More Active—The new products and the higher goals will result in an intensification of the sales effort. Three of four companies expect to strengthen their sales organizations. Three of five will add more salesmen; nearly half will increase the number of distributors; one in five will go after more foreign sales; and three of five will increase expenditures for advertising and sales promotion.

Expansion—Metalworking capacity is scheduled for a 5.6 per cent expansion during 1957. More than half the respondents are planning to add capacity through new plants, additions or the purchase of new production equipment.

The rate of expansion will be a little slower than it was in 1956. Two reasons are cited: 1. Tighter money. 2. Completion of projected programs.

One-fourth of the respondents say the capital shortage will force them to curtail or defer planned expansions.

Tight Money—While a number of respondents believe the tight money policy will help hold down inflation, and, if watched carefully, may be for the national good, the majority believe it will apply a squeeze on both expansion and modernization.

A press builder calls tight money "the greatest restraining influence in the sale of capital goods."

An eastern foundry says the tight money policy caught it in the middle of an expansion program and that it now is difficult to continue or stop at the halfway mark. While the respondent thinks the expansion money may be obtained, he fears higher interest charges will make borrowing uneconomical.

"Our business is most affected by the tightening of mortgage money for home construction," says a maker of valves and fittings. "We have increased our capacity and now must find new products if we are to hold or increase our volume."

A midwest office equipment manufacturer says the money policy boys should "realize that monetary management cannot and will not stop inflation; it is wage inflation." He believes that the increased cost of carrying inventories will make less money available for capital improvements.

A small electrical equipment maker says: "Our major problem is the shortage of capital for expansion. Higher interest rates and tightening credit will prove extremely detrimental to small companies. Small Business Administration assistance is slight, contrary to government propaganda."

Percentagewise, 28.5 per cent of the companies employing under 100 find their expansion plans will be hit by the tight money policy, compared with 17 per cent of the companies employing more than 500.

Other Problems—While respondents generate the most heat on the tight money policy, they have other problems. Some are those of a full economy.

Engineers and skilled workers are expected to be scarcer in 1957 as companies try to push up their output. A third of the respondents expect a shortage of skilled workers will impose a ceiling on their production.

Users of steel plates and shapes and nickel in all forms expect their output to be limited by the availability of these materials.

Foundries and steel plants see the high prices of scrap as a threat to their profit position.

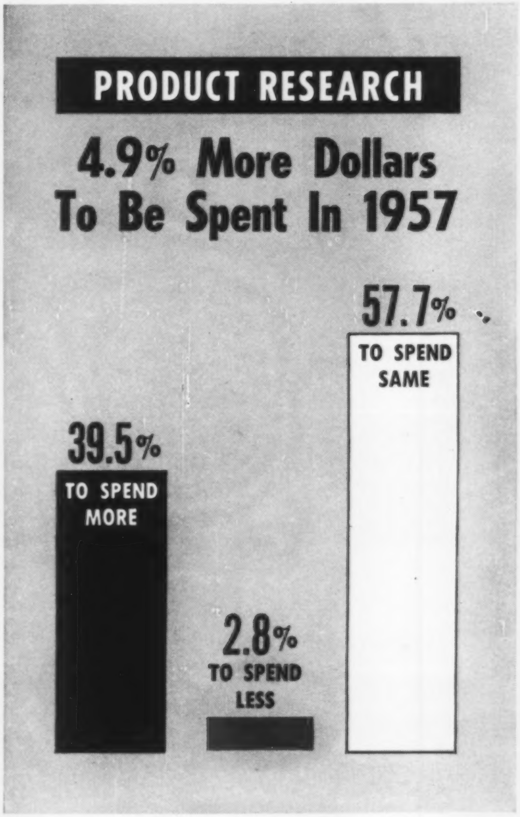
Threats from Abroad—Imports of foreign metalworking goods, produced with cheap labor, are listed as the No. 1 problem by some groups of industries. Loudest in their complaints are the makers of surgical and dental instruments and specialties.

For a Better Year—On the bright side, respondents expect demand for metalworking products will continue strong pretty much across the board. The only soft spot mentioned is the anticipated decline in home building.

Suppliers to the automotive industry look for a fairly substantial increase, with most estimates centering on 10 per cent.

Most capital goods makers expect sales this year will continue to increase, although at a slower rate than they did in 1956. Most manufacturers in the capital goods industries still have large backlogs.

Makers of agricultural machinery and miscellaneous farm equipment expect sales will rise



NEW PRODUCTS

61.6% Plan to introduce new products in 1957.

STRONGER SELLING

73.3% Will strengthen their selling organization in 1957.

OF THOSE—

58.4% Will add new salesmen.

45.4% Will have more distributors.

21.2% Will seek more export sales.

59.2% Will increase advertising and sales promotion.

24.6% Report Capital Shortages Will Curtail Planned Expansions

Analysis by Size of Plants	Capital Shortages Expected
Plants Employing 20-99	28.5%
Plants Employing 100-499	19.8%
Plants Employing 500 or More	17.1%
By Major Industry Groups	
S.I.C. 33—Primary Metals	19.8%
S.I.C. 34—Fabricated Metal Products	31.4%
S.I.C. 35—Machinery (except electrical)	22.5%
S.I.C. 36—Electrical Machinery	18.5%
S.I.C. 37—Transportation	23.2%
S.I.C. 38—Instruments, Related Products	23.7%
Other Metalworking Groups*	26.0%

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*S.I.C. 19, 25 and 39.

modestly. "We see a substantial replacement market for farm machinery coming in 1957 and 1958," says one implement company. "Equipment purchased after the war is wearing out, and farm income is turning upward again. Farm equipment sales can only go up."

Suez Boosts Oil—Purveyors to the oil fields expect an extremely active year. Many mention the needs of Europe for American oil, as well as increasing domestic demand.

"We believe this may be the year we will drill 60,000 wells, if pipe and other materials can be made available," predicts a large oil supplier.

Highway to Profits—A surprisingly large number of respondents anticipate new business from the highway construction program. It is mentioned more frequently than any other factor as a source for increased sales. Many companies that previously have not made equipment or material for road construction are planning to get into the act.

Continued high construction activity, particularly increases in commercial, conservation and public building, is viewed as a highly favorable factor. "We expect total construction to be up at least 5 per cent, and we never yet have had a deep recession while construction was booming," points out a manufacturer of builders' hardware.

Other frequently mentioned favorable factors are expectations for a reasonably stable labor situation growing out of the longer term wage agreements in the major industries, a favorable domestic political climate, increasing efficiency of production equipment resulting from recent modernization and automation programs and a host of new products designed to send buyers into a tizzy.

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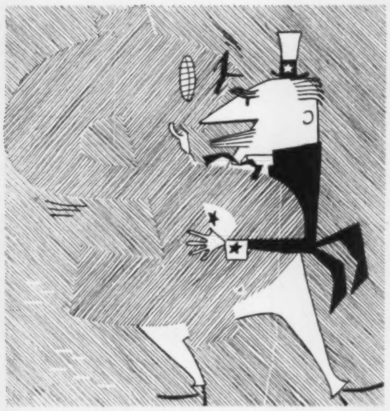


Busy year ahead as lawmakers wrestle . . .

The Problems of Prosperity

DOLLAR SIGNS will dominate much Washington thinking in the year ahead—keeping the economy going near top speed while avoiding runaway inflation. Both are problems of prosperity.

It means keeping a good climate for business, stimulating investment to provide the jobs needed by a growing population, holding down the cost of living.

War Drums—Closely tied in is the tense international situation which will bring new inflationary pressures in the form of increased defense spending.

So watch for these actions from Washington in 1957:

In their platform, Republicans promised continued reductions in government spending, but it looks as if they'll have to forego that in the coming year, and subscribe to the Democrats' idea of letting a growing economy pay for needed defense and civilian programs. They may be able to hang on to their highly prized balanced budget, but only if the economy keeps on bustling along at its present record pace.

Bigger Budget — In short, the outlook is for another rise in government spending. A year ago, the President asked for $66 billion to see Uncle Sam through fiscal 1957. Supplementary requests still to come up will push the final figure to over $69 billion. In view of certain prospects for stepped-up defense spending, expect the President to come up with a budget proposal of nearly $70 billion for fiscal 1958.

It's almost certain that it will be a balanced budget, with Republicans keeping their fingers crossed, hoping that prosperity-swollen revenues will keep it that way.

Some Paring? — There is some chance that Congress will be tougher on the President's budget requests this year than they were last year—they gave him most of what he wanted, plus some he didn't ask for. Some projects approved then have been classed as election year pork barrels. With Congress a little less conscious about the voters back home this year, it could be that economy advocates—and there are some on both sides of the political fence—may be able to exert enough influence in a nonelection period to overcome the enthusiasm of the free spenders.

In any case, defense costs are bound to go up. Defense Secretary Charles E. Wilson, for one, has said so, and he should know. Technology is creating new and better weapons, but their increased complexity make them more expensive to develop, operate and maintain. Much of the increase will go for airpower—aircraft and missiles—and atomic weapons.

Bellwethers—The upward trend was strongly indicated last summer when Gen. Nathan F. Twining, Air Force chief of staff, told a Senate Armed Services subcommittee that on a preliminary estimate the Air Force wanted $23.6 billion in fiscal 1958.

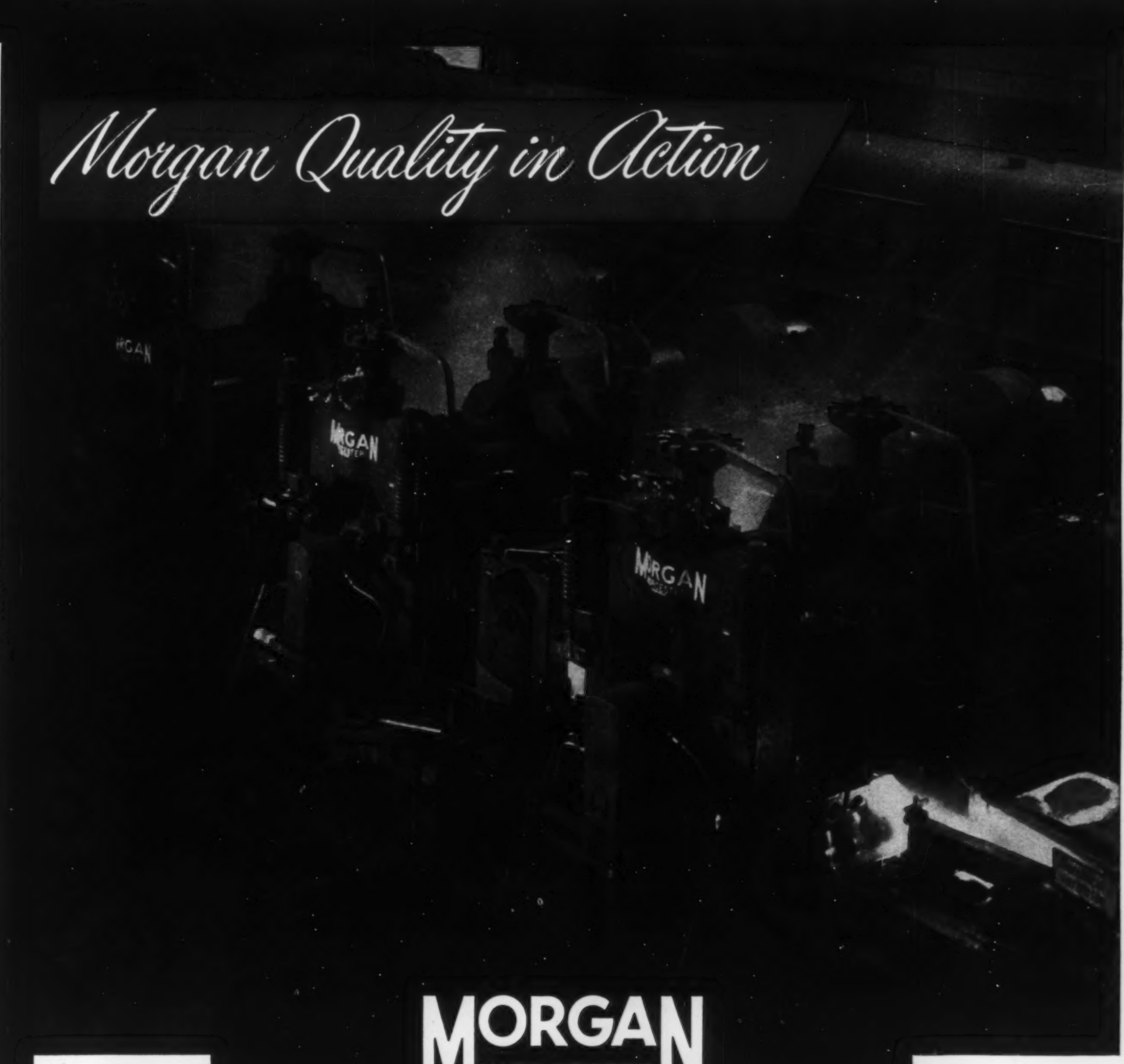
It's hardly likely they'll get that much: For fiscal 1957, the Air Force asked for about $20 billion which was pared to less than $17 billion by the time it was included in the over-all budget estimate presented to Congress by the President. Congress boosted that figure by about $1 billion last year; the same could happen again. With present world developments weighing on administration and congressional minds, the Air Force could wind up with about $20 billion.

Air Power—In the same vein, the Navy asked $12.8 billion last year, was allowed $10 billion. Indications are that it will want about $13 billion this year, with much of the increase for aircraft, missiles and antisubmarine devices. How much it'll get is a question, but it will likely be more than last year's sum.

Research and development for all the services will continue at a high level, probably setting a record that will top this year's $5 billion.

Shifts—Over-all, more than $11 billion is being spent on production and procurement this year. Expect that level to rise, and look for a changing product mix. Conventional weapons and equipment will bear the brunt of any cutbacks. Military construction will continue at a brisk pace, probably close to 1957's $2 billion. Work will go for more air warning sites, guided missile launching sites and

Morgan Quality in Action



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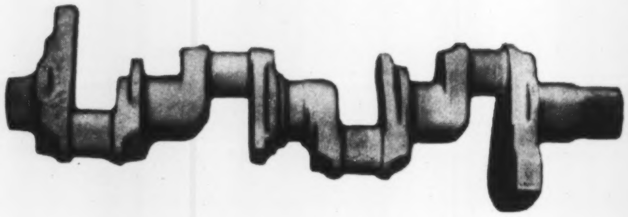
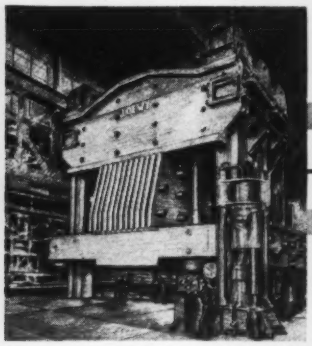


The crankshaft is the backbone of the piston-type engine. Illustrated above is the crankshaft forging for the most powerful piston-type aircraft engine ever produced.



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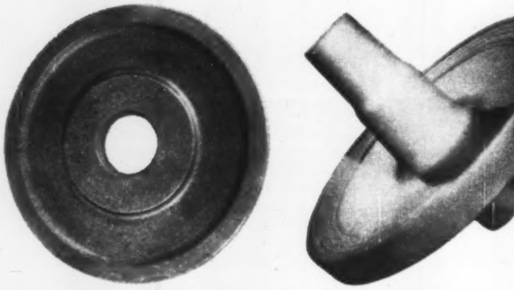
At the bottom left is a turbine disc forging made from high density heat resisting alloy, and next to it is a titanium compressor wheel forging for two of the most powerful jet engines yet produced.



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Problems of Prosperity for Small Business

SMALL BUSINESS is one of the big problems of prosperity. Most of the other problems—inflation, tight money, high taxes, strong competition and others—are involved. For indications of how the Washington wind blows, watch congressional treatment of the President's recommendations for small business aid. They will probably include:

1. Reduce the tax rate on business corporations from 30 per cent to 20 per cent on incomes up to $25,000.
2. Allow use of accelerated depreciation formulas of the 1954 Internal Revenue Code on purchases of used property not exceeding $50,000 in any one year.
3. Give corporations with, say, ten or fewer stockholders the option of being taxed like partnerships.
4. Permit the option of paying the estate tax over a period of up to ten years if the estate is mostly investments in closely held business concerns.
5. Make it easier for small business to get more government contracts.
6. Insure that need for advance or progress payments will not be a handicap in awarding government contracts.
7. Give prime contractors who subcontract to small business favorable consideration when examining profits for possible renegotiation.
8. Extend the life of the Small Business Administration.
9. Increase the amount of a corporate securities issue that may be exempted from registration with the Securities & Exchange Commission from $300,000 to $500,000.
10. Enact legislation for closer federal scrutiny of mergers.
11. Make procedural changes so antitrust laws are easier to enforce.
12. Simplify wage reporting by employers for social security and income tax purposes.
13. Simplify reports and statistics required of small business.

the conversion and construction of air bases which will handle newer, heavier planes.

With Congress already suspicious that the administration is slighting the nation's defense to achieve the highly prized balanced budget, there will be a tendency to boost requests (as was done last year) rather than to cut back.

The climb in federal spending could put an end to tax cut hopes, even the highly touted tax relief for small business. Add the inflationary pressures that tax reduction would apply to the economy to increase defense spending, and prospects look bleak indeed.

No Tax Cuts—Personal tax cuts are certainly out unless the economy takes a decided turn for the worse before midyear—an unlikely prospect at this time. More and more congressional and administration tax experts are stating that a period of high prosperity is not the time to cut taxes. There may be some bills introduced in Congress to reduce personal exemptions or reduce taxes on low incomes, but they will just be tokens.

Corporation taxes are unlikely to drop. The 52 per cent rate is here to stay for another year. The one exception here might be small corporations which figured prominently in campaign promises of both parties. If any relief is granted to them, it just increases the certainty that larger corporations will remain saddled with the present rate.

Small Business—The smallness of the expected budget surplus is one reason why small business may not get much relief in the coming year. Small corporations are only a fraction of the total number of small businesses, and there will be a move to bring these partnerships and proprietorships into line for tax relief along with small corporations. The result could be enough loss of revenue to push the federal budget into the red again, a move that would be strongly resisted.

Excise taxes will get a good look during the coming year. Cuts, though, are unlikely. Look for Congress to spend more time on the question before getting around to any action.

Deferment — The tax question

PRECISION PLANNING GUIDE for '57

Want to take some of the work out of your methods and equipment planning for the coming months? Let Cincinnati Engineering Service apply the newest and most advanced methods to your production grinding requirements. Cincinnati's complete line of precision centertype and centerless grinding machines gives you a choice of equipment to fit your individual needs. Five typical CINCINNATI® FILMATIC Grinding Machines are illustrated here. Of course, there are many more. In all, over 150 sizes of Plain, Universal and Roll Grinding Machines; six Centerless Grinders from 5 to 75 hp; Chucking and Micro-Centric Grinders; Surface Grinder; and special grinding machines. For brief specifications, look in the latest issue of Sweet's Machine Tool File. Or, if you don't have a copy, write for our new general catalog, just off the press, No. M-1961.

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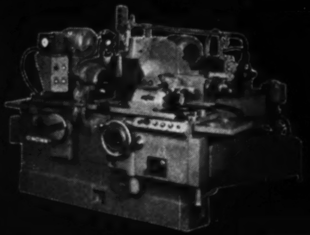

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plain centertype grinding; manual or automatic infeed grinding; automatic electric gage sizing, if desired; readily automated.

CINCINNATI FILMATIC Plain Hydraulic Grinding Machines of the type illustrated here will be your first choice for the work outlined at the left. There are four sizes: 6"R, 10"L, 10"R and 14"L. They incorporate a number of exclusive cost-reducing features, including FILMATIC grinding wheel spindle bearings and automatic grinding wheel balancing. The following types of production equipment are available: Push-button Automatic Infeed Attachment; Automatic Gap Eliminator; Behind-the-wheel Profile Truing; Automatic Air-Electric Gage Sizing with Cycle Time Stabilizer (as illustrated). Get the complete story in the following catalogs . . . 6"R and 10"L machines, G-660-1; 10"R and 14"L machines, G-661-1.

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toolroom centertype grinding, both external and internal; production and toolroom grinding combined.

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automatic diameter and shoulder grinding in unison; automatic electric gage sizing, manual or automatic flagging devices, if desired.

CINCINNATI FILMATIC Semi-Automatic Angular Wheel Slide Grinding Machines are tops for precision cylindrical work requiring accurately ground diameters and adjacent shoulders. Both are completed in one automatic infeed cycle. These machines, built in 6"R, 10"L, 10"R and 14"L swing sizes, are equipped with Automatic Grinding Wheel Balancing, FILMATIC grinding wheel spindle bearings and other cost-reducing features. They have plenty of capacity for multiple diameter work. Get your copy of catalog No. G-647-1.

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centerless grinding, infeed and thrufeed; variety or high production; short work and bar work; manual or automatic cycle grinding; readily automated.

CINCINNATI FILMATIC Centerless Grinding Machines are without question the finest equipment available for any type of work which can be centerless ground. Additional industries are constantly finding the CINCINNATI Centerless their most profitable precision grinding equipment. And you have the advantage of Cincinnati's 30 years' experience in centerless grinding applications. There are six in the Cincinnati line: No. 0, 2 (illustrated), 3, 4, 5 and 6; 5 to 75 hp. Many attachments available, including hopper feeds, spindle reciprocating, long bar equipment and others. All are included in Sweet's; individual catalogs available.

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may be put off until House Ways & Means Subcommittee on Internal Revenue gets finished with a "complete" look at the Republican-sponsored 1954 code. It could be 1958 before Congress does much in any area of tax cutting, in spite of much talk.

Tight money will continue to agitate congressional vocal cords.

But no change in present policies is likely as long as the economy is going full tilt.

Housing—To help home building, there will be a proposal to increase the interest rate on GI home loans. It will be resisted with a counterproposal for more direct home loans by the Veterans' Administration. The issue could be put off by a call for an investigation of the entire housing situation, though sentiment is for some quick action. Higher interest rates could be the result, with a look-see at housing to follow.

Also likely to be tied into counterinflation moves is the hearing on prices, profits and wages expected to be held by the Joint Economic Committee sometime in the spring.

T-H Again — Taft-Hartley remained a sleeping (watch) dog in the last Congress. Chances are good that it will soon be routed out and subjected to a rough going over. The Democrats said in their platform that they "unequivocably" advocate repeal, called the act viciously antiunion, inadequate, unworkable and unfair. The Republicans called for revision and improvement along the lines the President has recommended:

1. Softening some of the rules about secondary boycotts.

2. No bargaining required during the term of a contract unless the contract provides for it, or both sides consent.

3. A time limit of no representation elections during an economic strike.

4. Allow the President to recommend a settlement in national emergency cases.

5. Allow employer and union to require by contract that employees join the union within seven days.

6. Require stricter proof of agency in cases where there is a question of union responsibility for acts of agents.

7. State that management and labor have equal rights of free speech in all aspects of their relation.

8. Provide a congressional study and legislation on welfare funds.

9. Clarify states' rights to deal with strike emergencies.

10. Permit the NLRB to conduct a secret ballot strike vote.

Labor has consistently advocated complete repeal. If it can't get that, it'll go after whatever it can get. The prime second target is the part that allows states to have right-to-work laws. In that, labor has a powerful ally in James Mitchell, labor secretary, though his position has not been that of the administration.

Welfare Funds — There will be calls next year for legislation on pension, health and welfare funds. The Senate already has done considerable work along that line. Predictions are that the House will hold hearings this year, but the

Legislative Prospects, 1957

Taxes—Dangers of inflation put the axe to any chance of personal income tax reduction this year unless the economy begins to sag. The corporate rate will be continued at 52 per cent. Haggling could snip chances for small business relief.

Schools—Outlook is good for the enactment of the President's requested $1.6 billion in aid to construction. Political pressures will get the parties together on this though. Neither may be completely satisfied with the result.

Taft-Hartley—Democrats are pledged to repeal, Republicans to modification. Chances are good for some revision. Outright scrapping of the law looks remote.

Antitrust—Some tightening of the laws are possible, especially those regarding mergers. A prenotification provision could be passed. Enforcement certainly will continue active.

Small Business—Life of the Small Business Administration will be extended beyond its present June 30 deadline. Some expansion of authority could be given. More direct loans may be allowed if money continues tight. Stepped up programs to help small business with management problems are likely.

Housing—Public housing will continue along at about its present rate in spite of strong moves to greatly expand it. Moves to grant direct government loans for homebuilding will be popular but don't look to be too successful. An increase of the maximum interest rate on GI home loans, while not so popular, may get through.

Minimum Wage—There will be an effort to raise it again (this time to $1.25), but success this year is doubtful. More likely is action to insure strict enforcement of the "prevailing wage" requirement on government contracts and government assisted construction (Walsh-Healy and Davis-Bacon).

Natural Gas—This bill will be trotted out quietly and will probably get through this year. There will be token opposition but not enough to prevent passage.

WOCs—An attempt will be made to limit the role of businessmen in government, but the amount of agitation for it will depend greatly on the load of other congressional business.

Union Welfare Funds—The advisability of bringing these funds under federal scrutiny will receive continued study, but the com-

(Please turn to page 144*)*

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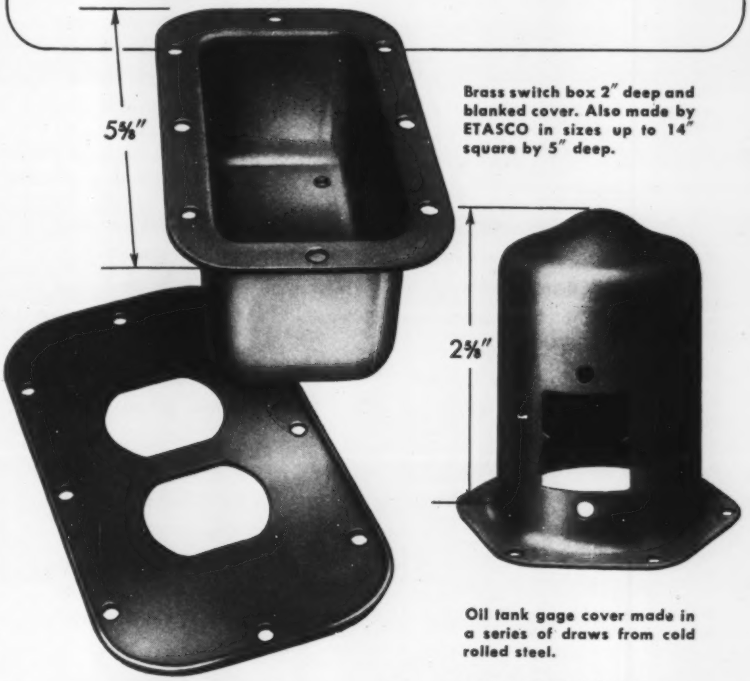

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(Concluded from page 142)

plexity of the problem will cause action to be put off.

Foreign Aid—In light of current world problems, there is little prospect for any reduction. Any increase will be in the area of economic assistance.

Foreign Trade—Little action appears ahead, though there will be continued vocalizing on the benefits of expanding it.

Hoover Commission—A few more of its recommendations that require legislation may be approved.

Atomic Energy—Chances look good for a big fight over expanded federal reactor projects. but the present partnership plan will be continued. The President's peace ship will be snubbed, but there's a good chance for authorization of a nuclear tanker.

Distressed Areas—Congress failed to get around to administration recommendations last year. Present prosperity has quieted many of the backers as business picked up in those areas, but the problem could get some attention if the President pushes it.

Postal Rates—An increase will hardly be more popular this year than last, but it is coming sooner or later. Other demands on congressional time could determine how much attention it will get.

OTC—The administration pushed for U.S. membership in the Organization for Trade Co-operation to administer the General Agreement on Tariffs & Trade, but Congress was leery. It could get around to it this year.

Health—Hospital construction assistance will continue but ideas of health reinsurance will again get the cold shoulder.

Veterans' Benefits—House was in favor of increasing them, but Senate didn't act. Same result likely this year.

Power—Hells Canyon and Niagara are the top items. The questions: Should Hells Canyon have a high or low dam? Should Niagara be under federal or state control? Some action should come this year.

Social Security—Watch for continuing efforts to expand coverage.

Civil Rights—An issue that will bring many hot words but little action as long as Southern Democrats control certain key committees.

Farm—Democrats will again seek a return to high, rigid price supports, but the effort won't be as strenuous as in last (election) year. The President will probably get most of what he wants for agriculture.

Hawaii-Alaska—Statehood looks no closer than it has been even though there is some bipartisan backing for the move.

problem is complicated, and considerable work will have to be done to satisfy all interested parties.

A question arises: Is this something that should be done by the states? Labor also is of the opinion that this should be handled by the Labor department. Some management groups feel it should be under an independent office such as the Securities & Exchange Commission. The outlook is for some work but no concrete action for some time.

Expect to hear many calls for revisions of the antitrust laws. Premerger notification looks like it might have a chance in spite of strong business opposition to it. Any imposition of it will go under the guise of protecting small business. The likely result: 90-day prenotification of intent to merge by corporations having combined assets of over $10 million.

Antitrust—Along the same line, the Justice department and Federal Trade Commission will continue a stepped-up attack on antitrust and restraint of trade cases.

There will be another legislative attempt to upset the supreme court's decision that good faith in meeting competition is a complete defense. Legislation would provide otherwise, whenever its effect may be to substantially lessen competition, or tend to create a monopoly.

Controls—The current high level of economic activity and the tense international situation have brought many questions about priorities and stand-by controls. Present attitudes rule new ones out, though the President already has considerable authority under the Defense Production Act to impose priorities.

In general, there is strong opposition to the government regulating distribution in peacetime, and that will be strong enough to forestall most moves in that direction. Only where there is a direct defense tie-in is there any chance for action.

Tankers—An interesting decision to watch will be Office of Defense Mobilization's stand on shifting tanker construction into a classification as a direct defense item. That would make plates available for the ships with a priority rate under the Defense Materials System. It could also indicate a chink in the armor of administration opposition to priorities and stand-by controls.

In atomic energy, there will be continued moves by the Democrats to junk the President's partnership program for atomic power development by advocating a big all-government program. Attempts to do that last year were repulsed, and the outlook is for the same this year.

All in all, it will be a busy year in Washington with some action, much study, more talk, headshaking and handwringing. Economic problems will top the domestic scene. The Middle East and Communism will give diplomats shaky moments and cause Uncle Sam to sign more checks than in any previous peacetime year.

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The function of an inner race is to provide a fatigue-resistant surface between a shaft and the bearing rollers. Because of roller bearing geometry, there is a smaller area of contact between inner race and rollers than between outer race and rollers. This concentrates more load on the inner race and makes it the critical member from a fatigue life standpoint, particularly when the inner race is the stationary member and maximum load is repeatedly applied at one point.

Since it is vital to good performance that the inner race does not work loose on the shaft, HYATT inner races are designed for relatively heavy press fits, so the inner race becomes an integral part of the shaft for all practical purposes. Other advantages of HYATT'S carburizing process and precision finishing operations are briefly explained at right.

You'll find more details in HYATT General Catalog No. 150, or your nearby HYATT Sales Engineer will gladly help you choose the type best suited to your design requirements. Remember, HYATT is America's *first* and *foremost* maker of roller bearings. Hyatt Bearings Division of General Motors Corporation, Harrison, New Jersey.

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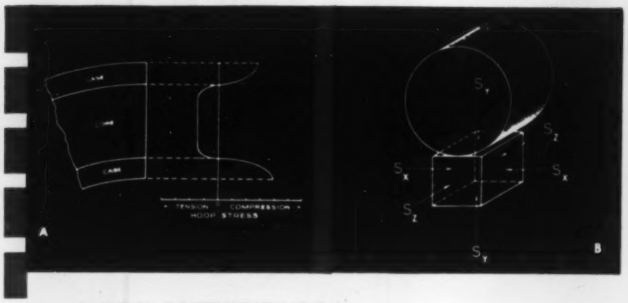
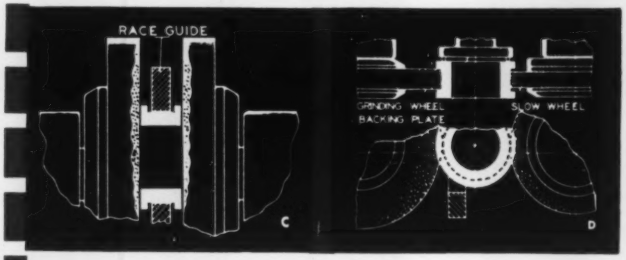
FOR MODERN INDUSTRY



1. WHY CARBURIZING?

Carburizing provides inner races with tough cores, and flanges that will not crack, with no loss of case hardness. This permits tight press fits and also improves load-carrying capacity as shown in Diagram A. During quenching, a volumetric change tends to stretch the core and compress the case. Due to the Poisson effect, the compressive hoop stresses in the external fibres build up the load-carrying capacity.

Diagram B shows a typical element under roller load. Stresses in the "Z" direction are negligible; those in the "X" direction are compressive hoop stresses or pre-load. Those in the "Y" direction are compressive stresses due to the load. Without the compressive stress Sx (hoop stress) the load capacity would be reduced; and if "X" were a tensile stress due to pressing a through-hardened race on a shaft, the bearing capacity would be still less.

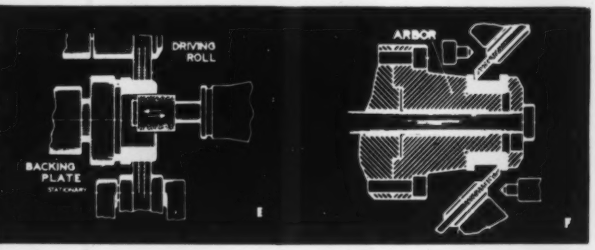


2. DOUBLE END GRIND

In grinding a HYATT inner race, the ends are first faced off square and parallel so they can be used as accurate reference during subsequent operations. The HYATT double end grind process (Diagram C) insures excellent control of parallelism.

3. CENTERLESS PATHWAY GRIND

Centerless grinding was pioneered by HYATT years ago, and eliminates excessive wall variation due to spindle and chucking errors. This method produces as nearly a perfect cylinder as is commercially practical. Two-point and three-point out of round and taper are held to a minimum. Note how work is rotated with backing plate against previously ground end (Diagram D) to insure accuracy.

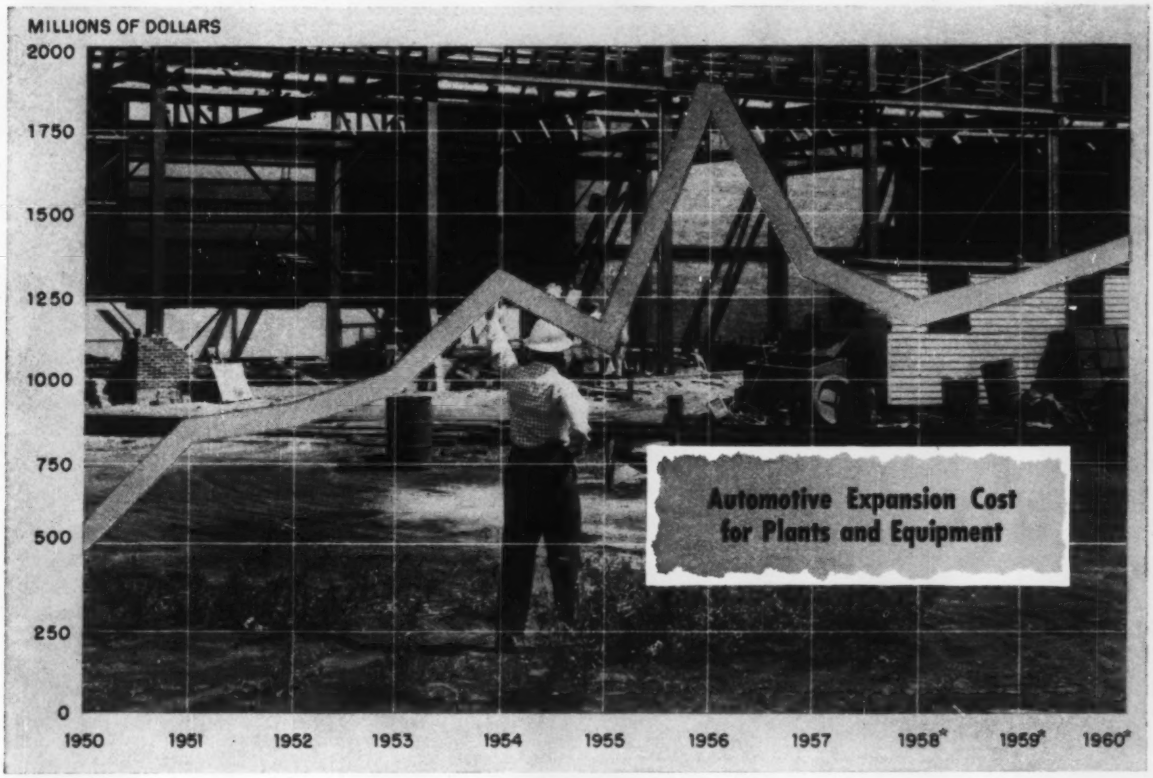


4. CHUCKLESS BORE GRIND

Here the centerless method assures a bore concentric with the pathway, with minimum wall variation, by removing stock from high spots as they pass between drive roll and related grinding wheel (Diagram E).

5. FLANGE GRINDING

To assure that they will run true with roller pathway, flange faces are also ground using the squared ends for reference (Diagram F). This establishes even contact with roller ends during bearing operation.



*Indicates trend only. No figures include new model tooling costs.
Sources: Commerce department, Automobile Manufacturers Assn.

Detroit Spending Pays Off

Auto assemblers expect record capital outlays of the past few years to show up in '57 in reduced costs, higher sales. Look for 6.8 million autos and 1.1 million trucks to be built

AUTO MAKERS are planning to put $1.3 billion into capital expenditures this year. That's almost $6 million less than they spent in 1956 when the current round of plant and equipment expansions hit full swing.

The industry looks at 1957 as a tie-up year. Loose ends are being brought together so car builders will be ready to shoot ahead for the 8 million and 9 million car years they see coming by 1965. Here's how 1957 stacks up.

Product Balancing—Model lines are being strengthened and consolidated in all companies. Chrysler's De Soto Division has added the Saratoga series to give it better coverage in the medium-high price field.

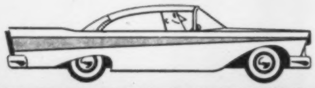
Harold Churchill, Studebaker-Packard president, has announced the Packard-Clipper will be in the medium price range. He says: "This will give us 17 to 18 per cent of the price class coverage instead of less than 2 per cent we'd get in the high price field."

Packard and Oldsmobile have added station wagons to their '57 lineups. The aim is to pick up a few extra bucks where the market is booming. Wagon sales are expected to increase to almost 15 per cent of car output. In 1956, station wagons accounted for 11.2 per cent of all production, says *Ward's Automotive Reports.*

Top Two—While General Motors is content to hold the line with present models, Ford will do the heavy realignment job this year. Its Edsel series will bracket the Mercury to give Ford model for model coverage with GM.

Earnest Breech, Ford's chairman, already has stated the Edsel will be built on Ford and Mercury assembly lines and will utilize some stampings from these cars. Richard Krafve, Edsel division general manager, maintains the car will be so distinctive no one can mistake it for any other automobile.

The rumor persists that the Ed-

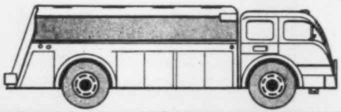


U.S. Passenger Car Production

(In thousands of units)

	1957*	1956	1955	1954	1953
1st Quarter	1745	1742	2129	1426	1520
2nd Quarter	1975	1450	2128	1532	1736
3rd Quarter	1455	1042	1736	1164	1587
4th Quarter	1625	1576†	1949	1387	1291
Totals	6800	5810†	7942	5509	6134

*Estimated. †Preliminary. Source: *Ward's Automotive Reports.*



U.S. Truck Production

(In thousands of units)

	1957*	1956	1955	1954	1953
1st Quarter	305	314	264	284	343
2nd Quarter	290	284	378	274	291
3rd Quarter	235	237	292	216	306
4th Quarter	270	275†	312	248	263
Totals	1100	1110†	1246	1022	1203

*Estimated. †Preliminary. Source: *Ward's Automotive Reports.*

sel is aiming at the four-passenger sports car field. Additional barroom comments tie it to Continental Mark II design theory. The two aren't incompatible. With anticipated 1958 output of 200,000, Ford hopes the Edsel will take sales away from Pontiac, Buick and Dodge—to a lesser extent, also Oldsmobile and De Soto. Another competitor may be Studebaker's Hawk.

Plant Expansion Slows

New models call for new plants for assembly and the manufacture of parts. Most major projects will be completed this year although a few like Ford's Lima, O., assembly plant, won't be ready until 1958. Look for a minimum number of plant announcements in '57.

Chrysler has two projects in the works. The first line of presses in its Twinsburg, O., stamping plant will start thumping in February. The Newark, Del., tank plant will start to assemble Plymouths in the first half of this year. Dodge assemblies will follow before the year is over. It's understood that Chrysler is holding up construction of two assembly plants and a research and engineering facility until 1958.

Dearborn Developments — Ford Motor Co. has poured about $3.6 billion into plant and facility expansions since the end of World War II. Some $375 million is earmarked for building this year; another $177 million will be spent in '58 and '59. Tooling and equipment costs, exclusive of new model tooling, will add about $125 million to the 1957 tab. Result for Ford: An additional 50 million sq ft of floor space by early 1958.

Improvements — General Motors Corp. will spend $700 million on capital investments in 1957, a 25 per cent drop from last year's sum. Says Harlow Curtice, GM president: "It will be used for facilities to enable us to take full advantage of the technological progress which is being made in the machine tool industry. Not much of it is for expansion."

By the end of this year, GM will have spent $5.2 billion on capital expansion since 1946. This doesn't include special tooling projects. The corporation has its research and engineering setup in good shape. Most parts plants are adequate for increased production quotas. Assembly lines need some bolstering—particularly for Pontiac and Chevrolet. These are likely to be the two divisions which have major projects planned for the next two years.

Trends—Underlying all manufacturing expansions in the last five years has been the trend to decentralization.

Chrysler Corp. is the only company which still has most of its manufacturing operations in and around Detroit.

New Faces Staff Plants

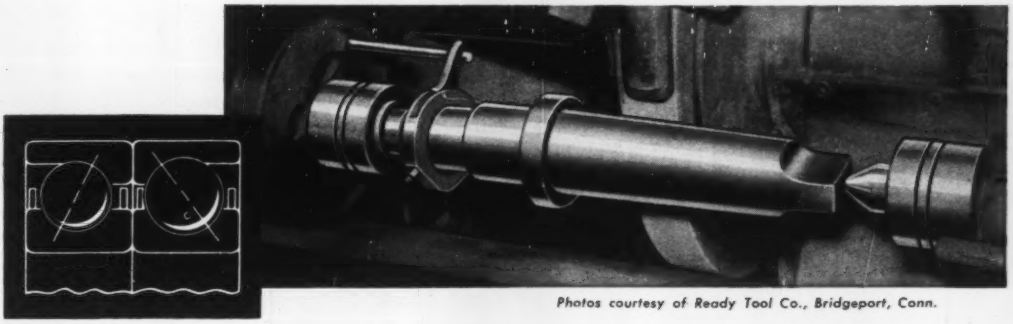
Plants and products call for management. The industry is finishing up a period of reorganization to give more responsibility to lower level management and still retain a firm chain of command to top echelons.

In the last year, Chrysler has pulled its many manufacturing divisions into two basic groups under one central authority. The regrouping has brought up a flock of younger management people. L. L. Colbert, Chrysler's president, thinks this young blood will be the key to future success. He's prob-

FACTS

about

NEW DEPARTURE BALL BEARINGS



Photos courtesy of Ready Tool Co., Bridgeport, Conn.

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Accuracy . . . *to within less than .000050" total indicator run-out!* That's the performance live centers designed around New Departure preloaded ball bearings deliver!

Such super accuracy of work stems from *extreme rigidity* . . . the unsurpassed ability of these preloaded duplex ball bearings to handle combination loads with minimum deflection.

In live center applications, New Departure ball bearings with medium and high contact angles are mounted duplex and positively clamped together to assure the correct predetermined preload condition. As work expansion increases the thrust load, radial centering becomes more rigid and accuracy is precisely maintained.

New Departure ball bearings for live center applications are made to ultra-precision tolerances. Smooth operation with low frictional loss is assured, as well as continuity of accuracy throughout long life. Write for further details.

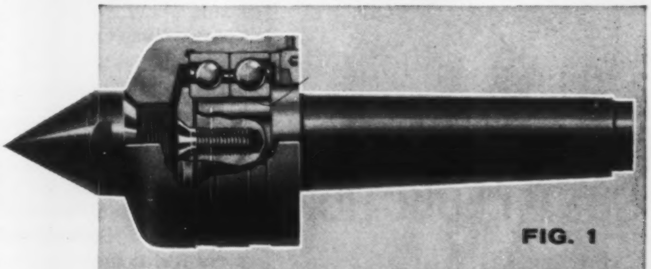

FIG. 1

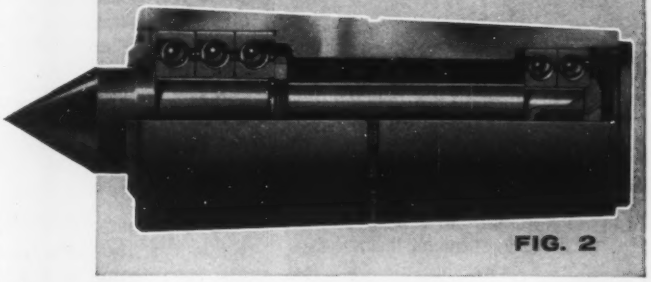

FIG. 2

(Fig. 1) Tapered-shank, spindle-type center in which New Departure ABEC 7 specification duplex ball bearings support grinding loads with undiminished accuracy throughout long use.
(Fig. 2) Enclosed spindle designed around five New Departure ultra-precision preloaded duplex ball bearings.

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ably right, but younger men lack experience. This inexperience, as much as drastic model changes, has brought about some of the production hangups Chrysler suffered getting 1957 cars under way.

Replacements—The picture is a bit different at Ford. Many of the top divisional production men are close to retirement age. Ford's problem: Who will replace them? There seem to be few people of executive caliber who are ready to fill in, although the company has plenty of strength at the middle management level. Ford has about three years to bring up men from middle management and train them to take over top jobs.

GM is standing pat. It has a farm organization which brings up at least two candidates for every top position.

AMC, S-P Keep Afloat

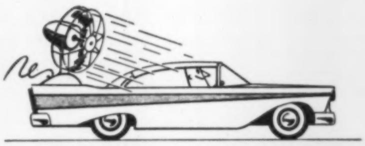
Reorganization and consolidations on the part of the Big Three mean Studebaker-Packard and American Motors Corp. will have to push even harder to keep their heads above water. The next two years will be crucial for both firms.

Studebaker-Packard is cutting costs to the bone in an effort to break even in '57. Mr. Churchill says the company must sell 153 000 cars to stay in the black. S-P had to bring out the Packard Clipper to maintain any kind of dealer organization. Some production experts feel it may hurt more than it will help because an additional line of cars may not pay for itself.

Watchdog — The South Bend, Ind., outfit is closely supervised by Curtiss-Wright which has assumed an advisory position in management in exchange for financial aid and credit.

C-W is quarterbacking all major plays for the auto company and also negotiating with Daimler-Benz, Germany, for product exchange agreements on items like fuel injection, suspension systems and manufacturing methods. Some D-B developments are expected to turn up on Studebaker cars in 1958.

AMC Outlook—Similar problems beset American Motors Corp., although this firm is in a slightly stronger position in regard to its product line and dealer structure. In addition, Kelvinator appliances have had a boom year which helps take the load off the auto end of the business.



Air Conditioner Sales
(Thousands of units)

1957	310*
1956	251
1955	187
1954	57
1953	41

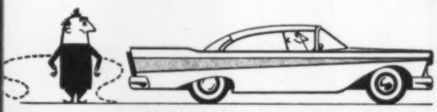
*Estimated by STEEL.
Source: *Ward's Automotive Reports.*

Here's AMC's big headache: Its Rambler is getting out of the small car class in price and economy. While unit body construction still is a good selling point, even George Romney, AMC president, expects competition in that quarter by 1959 at the latest.

Way Out—Both companies have a potential solution. Studebaker-Packard can diversify into the appliance business (rumored to be in the planning stage), strengthen defense contracts and dual its dealerships. Then it will be in position to close out all model lines but trucks and the Studebaker Hawk which have strong market appeal.

American Motors is in an even better spot to do the same. It can develop Kelvinator, put defense work on a paying basis (expected to be in the black in 1959) and concentrate on the Rambler and Metropolitan. These cars offer features which aren't on other American automobiles. AMC already is beefing up its Rambler dealer structure. The feeling in Detroit is that this will be AMC's position by 1960.

Make or Break — Tooling contracts already released are one indication that neither outfit is about to fold this year or next. The industry is eyeing Chrysler, which faces a make or break situation.

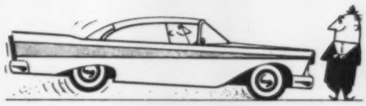


Power Steering

(Per cent of U.S. car output)

1957	30.0*
1956	27.1†
1955	23.2
1954	19.0
1953	11.7

*Estimated by STEEL.
†Preliminary.
Source: *Ward's Automotive Reports.*
Installed in calendar year.



Power Brakes

(Per cent of U.S. car output)

1957	28.0*
1956	24.1†
1955	22.4
1954	18.0
1953	8.1

*Estimated by STEEL.
†Preliminary.
Source: *Ward's Automotive Reports.*
Installed in calendar year.

The smaller member of the Big Three has spent more than anyone else on 1957 models. It reportedly is ready to commit another $100 million for 1959 cars. Unofficial comments reveal the company has programmed many production and tooling schedules on the basis of 20 per cent of a 6.5 million market in 1957. In 1956, Chrysler accounted for 17.3 per cent of total output. It must take a minimum of 18.5 to 19 per cent of 1957 production to keep out of the red.

Optimism — Chrysler expects to do just that. The industry hopes it will.

As many sources have pointed out, Ford and GM would face government displeasure if other car producers went out of business.

New Models Move Along

As consolidations continue, builders are getting 1958 models under way. There will be few styling changes except for Chevrolet, Pontiac, Lincoln, Rambler and Packard. The four-door hardtop will be the basic body style across the board in 1958. Sales of optional equipment accessories will continue to grow (see charts).

Biggest changes will be on the engineering side. So far, five new engines are being tooled for '58. The gas turbine and free piston controversy will get lots of talk in '57 and '58. Nothing concrete in the way of use is anticipated before 1959—probably not then.

Transmissions — At least three more transmissions will appear on next year's cars. Buick had one set to go this year, but last minute operational quirks shelved it until 1958. More emphasis will be placed on air suspension. General Motors should bring out some version on at least two series. Air Ride now is standard on Cadillac's Eldorado Brougham; Cadillac will probably use it across the board later in the '57 model year or in 1958.

Horsepower has gone up again. It will climb a bit more in 1958.

Cure — Car weights have increased 100 to 300 lb this year. The 14-in. wheels have resulted either in smaller size brake drums or in less cooling area for brake linings. The 1958 programs point up these items of interest:

Better lining, probably ceramic base materials, will appear. More wheel discs will be finned and fluted to get air to the brakes. Fender wells will flash out an inch or two for faster brake cooling. At least one car is hoping to bring out double disc brakes in 1958.

Materials Get Look-See

With every styling and engineering change, car designers rehash ways of making parts more attractive, less expensive. Aluminum is the favorite nonferrous metal

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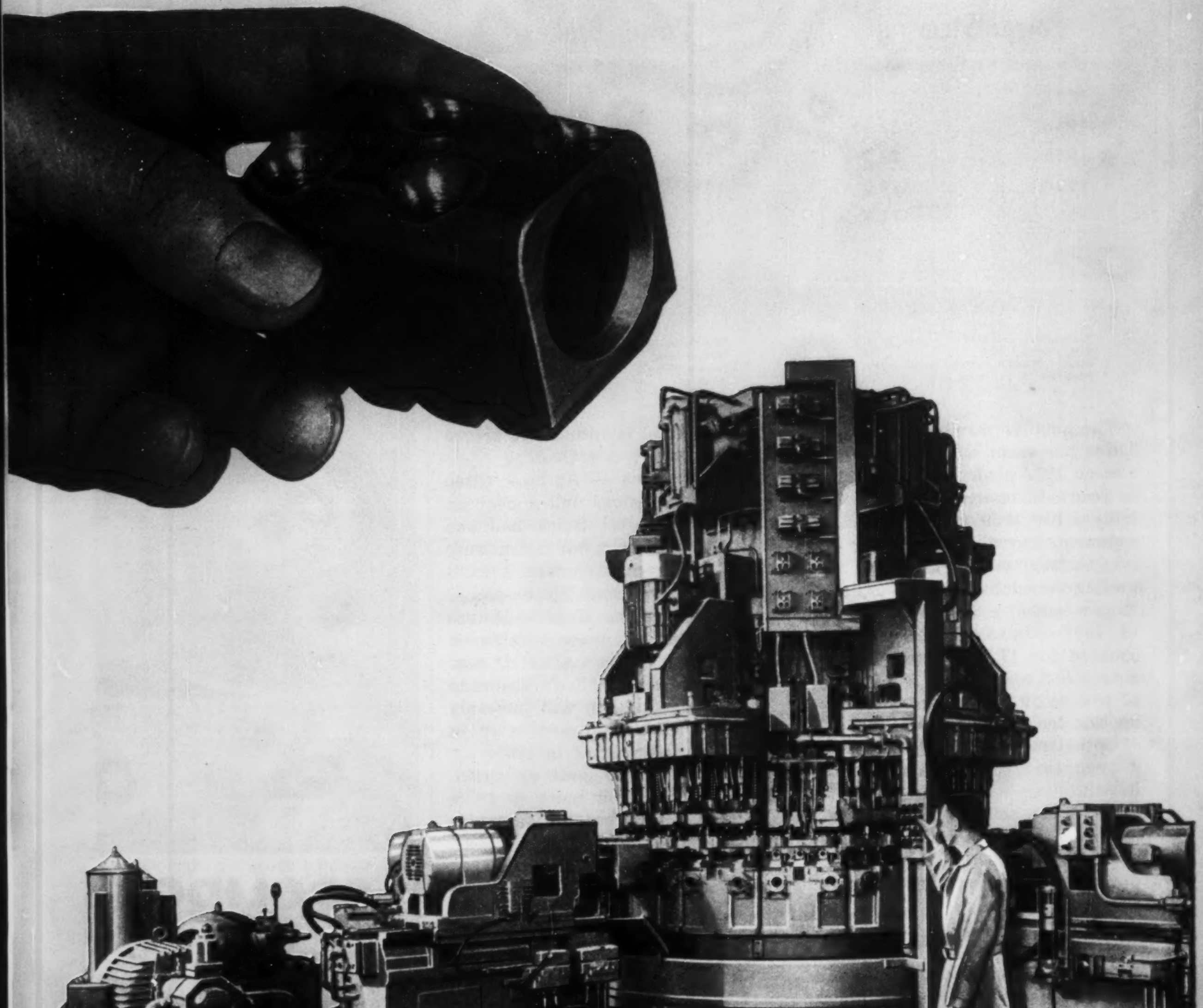

SNYDER
SNYDER

Machining Small Parts is Snyder Center Column Machine

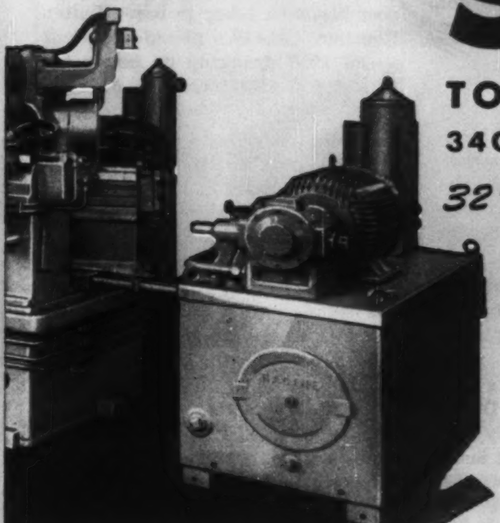
The principle of automation is inherent in the design of this machine which performs, in its continuous 16-station cycle, 25 operations equalling the performance of two or three ordinary machines. The workpiece is a small automotive steering gear ball nut 2½″ x 1⅝″ x 1⅞″. Production is 331 pieces per hour.

Three workpieces are loaded and automatically clamped in each of the 16 fixtures on the 96″ index table. A unique feature of the machine is its special heavy-duty cast iron center column 108″ high and 48″ in diameter. This massive column is necessary to withstand the high vertical thrust loads imposed by six heads mounting 9 spindles each which drill, flat bottom drill and radius chamfer four recirculating ball holes and tap drill and chamfer one hole in the same part face.

The table is also designed to withstand high horizontal thrust loads for core drilling, chamfering and reaming the threaded shaft hole which requires three spindles for each of the seven Snyder heavy-duty way type units.

The machine, one of the largest of its type, weighs 50,000 lbs., requires 288″ x 312″ floor space and stands 156″ high overall.

If you have an automation problem in machining small parts, this type of Snyder machine may be the right answer.



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32 Years of Special Machine Tools with Automation this year. Ford's ten-year contract with Reynolds Metals Co., Louisville, plus its aluminum foundry at Sheffield, Ala., indicate that it has some long-range plans for it.

The plans include more interior and exterior trim. Some of it will be anodized in colors other than silver and gold. Aluminum transmission housings already are accepted. Chrysler figures on switching to aluminum housings later this year. Wheels and oil pans are rumored to be next, but as far as is known, no company will bring out an all-aluminum bumper or engine block in 1958.

Styling Trend for '57

The rearward look, in Ford

The rearward look, in Chevrolet

The rearward look, in Plymouth

Competition — Stainless steel is seeking the top spot in trim circles. Producers figure the industry will use 132,000 tons of the metal in 1957, compared with 142,000 tons of aluminum. These predictions are based on a 6.8 million car year.

For 1958, radiators will be a choice area in which to find stainless in any greatly increased amounts. Ford Motor Co., is the best place to look, although Chrysler also has some ideas. Minor items in '58 will be trim strips, door handles and wheel covers.

No Sweat — Plastics are not sweeping the auto industry as rapidly as some worrywarts feared. Plastic compounds have proved useful in interior trim applications, for short run stamping dies and for certain types of pattern making. Aside from these areas, car builders haven't found any reason to change from hot and cold-rolled sheets. It looks like plastics will make a slow advance in specialty items, will pose no major threat for some time.

Powdered metals are a more interesting development to watch. Bearings, bushings and some types of small turbine blades are hot prospects for powdered metals.

Production Keeps Pace

Materials and designs are translated into finished cars on production lines. Three aspects of the production problem are worth watching in 1957-58, according to assembly line engineers.

Gatelining, the process of fitting several body panels into one welding fixture, is becoming more popular. It's been used in several of GM's Fisher Body plants and Ford's Mercury Division. Dodge switched to gateline assembly this last year. Other divisions will make the change-over as rapidly as possible, even though tooling people estimate it will add 20 per cent to annual tooling costs.

The result is faster, more accurate body assembly. Much of GM's $700 million will be spent on gatelining this year.

Suppliers To Feel Pinch

Partmakers will be squeezed again as quality tightens up and additional plants go into production. These bigger facilities have to pay for themselves. Manufacturers of parts face two choices:

Large suppliers can diversify into nonautomotive fields. Smaller companies, which don't have capital to diversify, do have a chance if they specialize on one or two items auto companies can't do without. Examples are door handles, window frames, windshield wipers, engine and transmission components.

Well Off—Tool and die shops are about the only supplier group which has no worries about getting business. The big 1958 tooling contracts are out, and some 1959 work is on its way.

Tooling costs won't be as high as they were for '57 models. Chrysler Corp. is figuring on about $90 million. Ford has the extra bill of setting up the Edsel, so its tooling should be around $280 million. GM will spend slightly more than that, with major changes scheduled for Pontiac and Chevrolet.

UAW Girds Loins

All this production activity is possible with labor peace. Walter Reuther, UAW president, will spend 1957 dragging up heavy artillery for 1958 contract negotiations.

Second Wind—As the auto industry winds up its second round of major expansion in preparation for at least one 10-million car year by 1965, the present sales race continues.

Sales staffs are playing the market by ear. Production is ready to shift into high if it looks like 1957 prospects will buy more than 6.5 million cars. Right now, cautious observers talk about 6.2 million as a "safe" figure. No one can quite figure out how many 1955 buyers will be ready to go again.

Our prediction for 1957: Chevy beats out Ford. Buick just edges Plymouth. Total domestic car output: 6.5 million.

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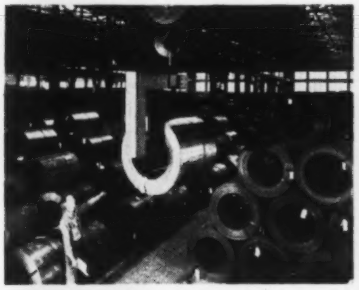

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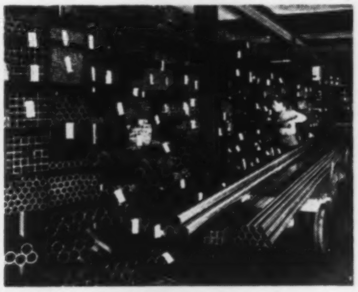

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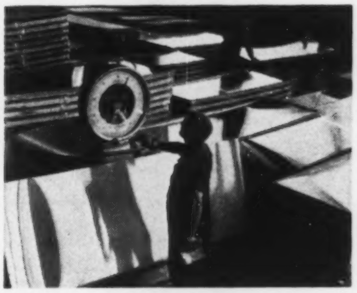
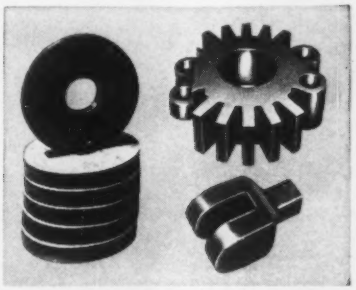


STAINLESS—Allegheny stainless in over 2,221 sizes, shapes, types, finishes: sheets, plates, bars, pipe, etc.



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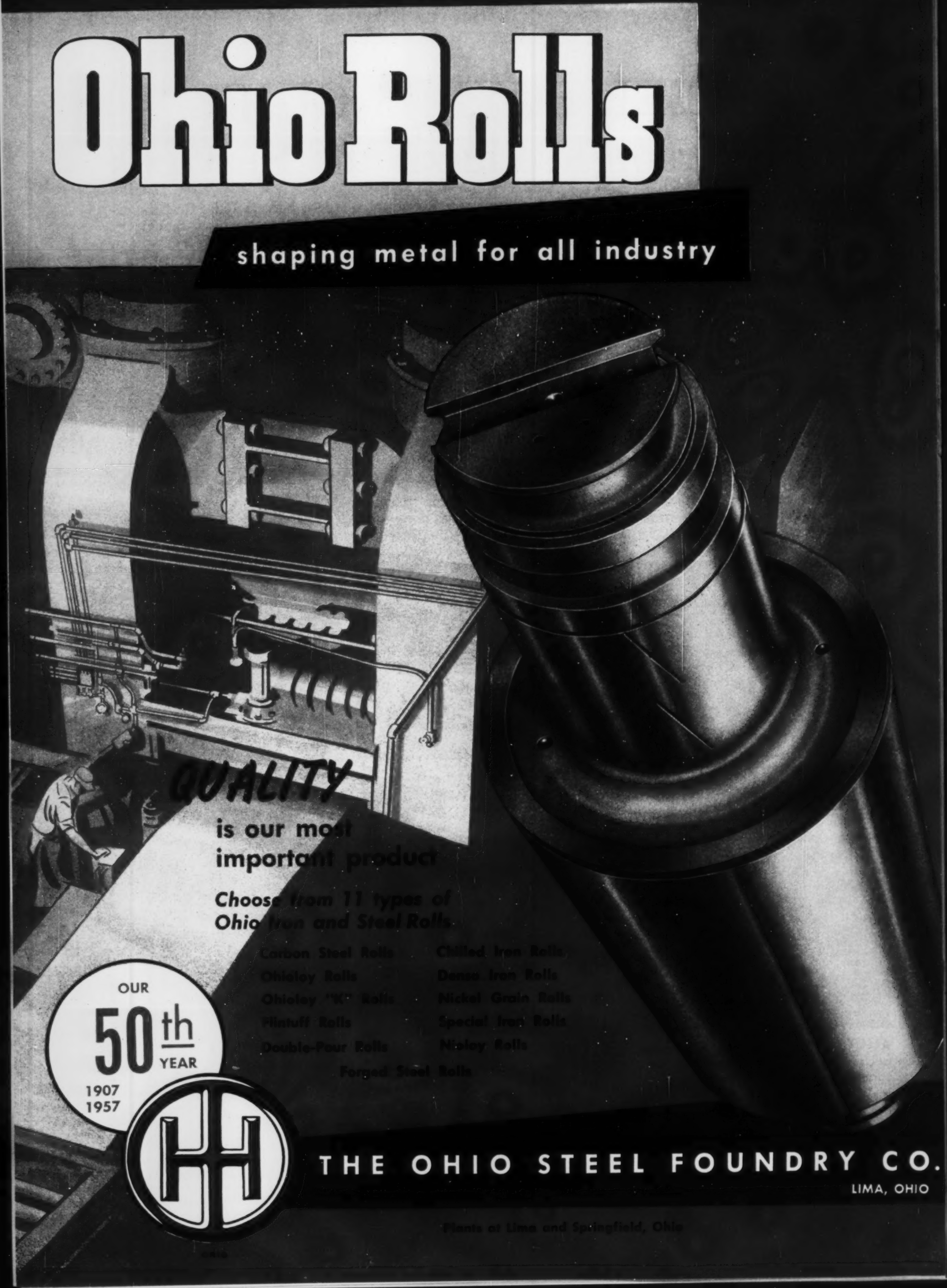

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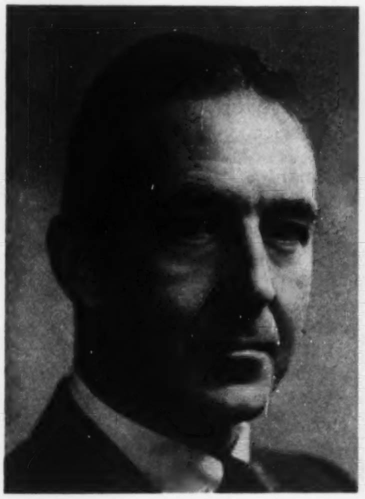


KEMPTON DUNN
. . . American Brake Shoe chief executive

DR. C. H. MOORE
. . . Mallory's director-research & dev.

ALFRED J. CHANDLER
. . . Osborn Mfg. div. sales manager

Kempton Dunn, president of **American Brake Shoe Co.,** New York, was elected chief executive officer. **William B. Given Jr.,** former chief executive, will continue as chairman.

Claude L. Alexander was made general sales manager, **Sun Tube Corp.,** Hillside, N. J. He was assistant to the president.

Elmer E. Burk was made manager of **Acme Steel & Malleable Iron Works,** foundry division of Buffalo Brake Beam Co., Buffalo. He was sales manager of Crucible Steel Casting Co. in Cleveland for the last two years.

Neele E. Stearns was elected president, **Crane Co.,** Chicago, to succeed **Frank F. Elliott,** now chairman. Mr. Stearns was vice president for planning and development at Inland Steel Co.

M. M. Anderson was elected president; **R. F. Treuer,** vice president-general manager of **Atlas Brass Foundry,** Los Angeles. **Frank Anderson** resigned as president and general manager after 34 years of service.

David E. Patty was named assistant purchasing agent for **Leece-Neville Co.,** Cleveland. He was senior buyer of the company.

Dr. C. H. Moore was appointed executive director of corporate research and development at **P. R. Mallory & Co. Inc.,** Indianapolis. He was director of engineering, metallurgical divisions.

Beryllium Corp., Reading, Pa., appointed **Max C. Farmer** to the new post of technical director. Former general superintendent of the corporation, he left in 1945 to work as director of the engineering division, Allied Commission in Rome, Italy. In 1947, he joined the engineering division at Aluminum Co. of America and most recently served as staff metallurgist, Materials Advisory Board, National Academy of Sciences, Washington.

Robert L. Brammer was elected vice president-sales for **Ackermann Mfg. Co.,** subsidiary of Wheeling Steel Corp., Wheeling, W. Va. He continues as manager of Wheeling's container sales division.

Dr. Bela K. Erdoss was elected president of **Korfund Co. Inc.,** Long Island City, N. Y. He also is president of Cork Foundation Co. Inc. and Korfund Co. (Canada) Ltd. In these positions he succeeds **Siegfried Rosenzweig,** who organized Korfund in 1923, and is retiring from active direction of the firms.

Alfred J. Chandler was appointed sales manager, brush division, **Osborn Mfg. Co.,** Cleveland. He was manager of industrial sales.

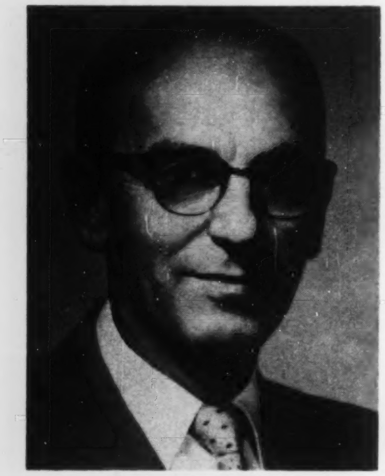
Bland B. Button was appointed vice president-sales for **Diversey Corp.,** Chicago. He was general sales manager. Mr. Button assumes the post made vacant by the semi-retirement of **W. E. Noyes.** Mr. Noyes continues as Diversey's manager of South American operations, and will serve as a special consultant.

Joseph F. Quaas was appointed vice president in charge of manufacturing and production for **Eutectic Welding Alloys Corp.,** Flushing, N. Y.

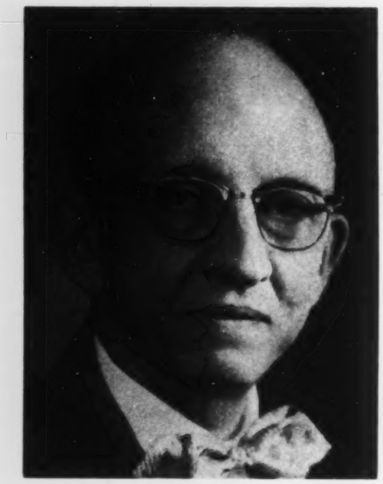
Earl W. Haugh, associated with **Heresite & Chemical Co.,** Manitowoc, Wis., from 1944 to 1950, returns to the company as vice president and director of sales. **Rudolph Stockinger** was made assistant production manager; **Otto Kollath,** superintendent of the chemical department.

J. C. Lucas succeeds **Frank M. Robbins Sr.,** retired, as president of **Ross-Meehan Foundries,** Chattanooga, Tenn. Mr. Robbins assumes the title of executive consultant. Mr. Lucas, who joined the firm a year ago, had previously

MEN OF INDUSTRY



. . . Illinois Gear & Machine elects three vice presidents:
T. S. PACER



E. B. SMILEY

G. P. SULLIVAN

been a consulting engineer with Meehanite Metal Corp.

T. S. Pacer, E. B. Smiley and **G. P. Sullivan** were elected vice presidents of **Illinois Gear & Machine Co.,** Chicago.

Clinton E. Smith was made assistant to the general sales manager, **Pratt & Whitney Co. Inc.,** West Hartford, Conn. **Harry Reichert,** export manager since 1950, was named a vice president.

Robert Lyle was appointed chief chemist for **National Electric Products Corp.,** Pittsburgh. He succeeds **R. J. McCrory,** retired. Mr. Lyle formerly served as research chemist with Simplex Wire & Cable Co., and as a product development engineer for General Electric Co.

Thornton F. Holder was made director of research for **Diamond Alkali Co.,** Cleveland. He replaces **Dr. Albert W. Meyer,** resigned.

Clipper Diamond Tool Co. Inc., New York, appointed **W. L. Wiese** as midwestern sales manager. Mr. Wiese was head of the Cleveland office.

H. F. Robertson was made manager-technical planning, **Bakelite Co.,** a division of Union Carbide & Carbon Corp., New York.

Robert E. Buckholdt was made manager of engineering, **Selas Corp. of America,** Dresher, Pa. He was vice president of Kendall Contracting Inc.

Robert J. McCarthy, president and general manager of **Missouri Refractories Co.,** Los Angeles, retains his position as head of the refractories wholesale firm while acting under appointment of Mexico Refractories Co. as general manager of its Atlantic Division.

Edward M. Hanson was named manager of the new Baltimore sales office of **Clark Controller Co.** The office will serve Maryland and the District of Columbia.

Dr. Glenn H. McIntyre assumes active management of **National Spectrographic Laboratories Inc.,** Cleveland. Associated with Ferro Corp., Cleveland, for 30 years, he resigned Dec. 31 as vice president and technical director.

Louis C. Getsinger was appointed superintendent of cable accessory manufacturing at the Massena, N. Y., Works of **Aluminum Co. of America.**

Donald S. Holmes was made quality control engineer-applied research and development for **General Electric Co.'s** manufacturing services, Schenectady, N. Y.

G. R. Moore was made staff vice president-sales and advertising for **Thompson Products Inc.,** Cleveland. He was a Thompson vice president and manager of its valve division.

Harvey Gaylord was elected president of **Bell Helicopter Corp.,** newly created subsidiary of Bell Aircraft Corp. Mr. Gaylord was general manager of Bell Aircraft's Texas division in Ft. Worth.

John J. Durnan was made eastern regional product engineer, **Behr-Manning Co.,** Troy, N. Y., division of Norton Co. He succeeds **Elmo Oathout,** retired.

Charles T. Link Jr. was made chief engineer for **Wayne Mfg. Co.,** Pomona, Calif.

Theodore L. Kishbaugh, manager of the Los Angeles steel service plant of **Joseph T. Ryerson & Son Inc.,** was made assistant vice president in the procurement department, with headquarters in Chicago. **Wayne D. Dukette** becomes general manager of the Los Angeles plant and continues as general manager of the San Francisco plant.

Sydney E. Cowlin was appointed director of market research for **Eaton Mfg. Co.,** Cleveland. Associated with the Reliance Division in Massillon, O., he served for over 13 years as its advertising and sales promotion manager.

National Carbon Co., division of Union Carbide & Carbon Corp., named **Robert J. Zavesky** district works manager in charge of its plant at Columbia, Tenn., and its new plant under construction at Lawrenceburg, Tenn. **Carl E. Stollenmeyer** succeeds Mr. Zavesky as manager of the Fostoria, O., plant;

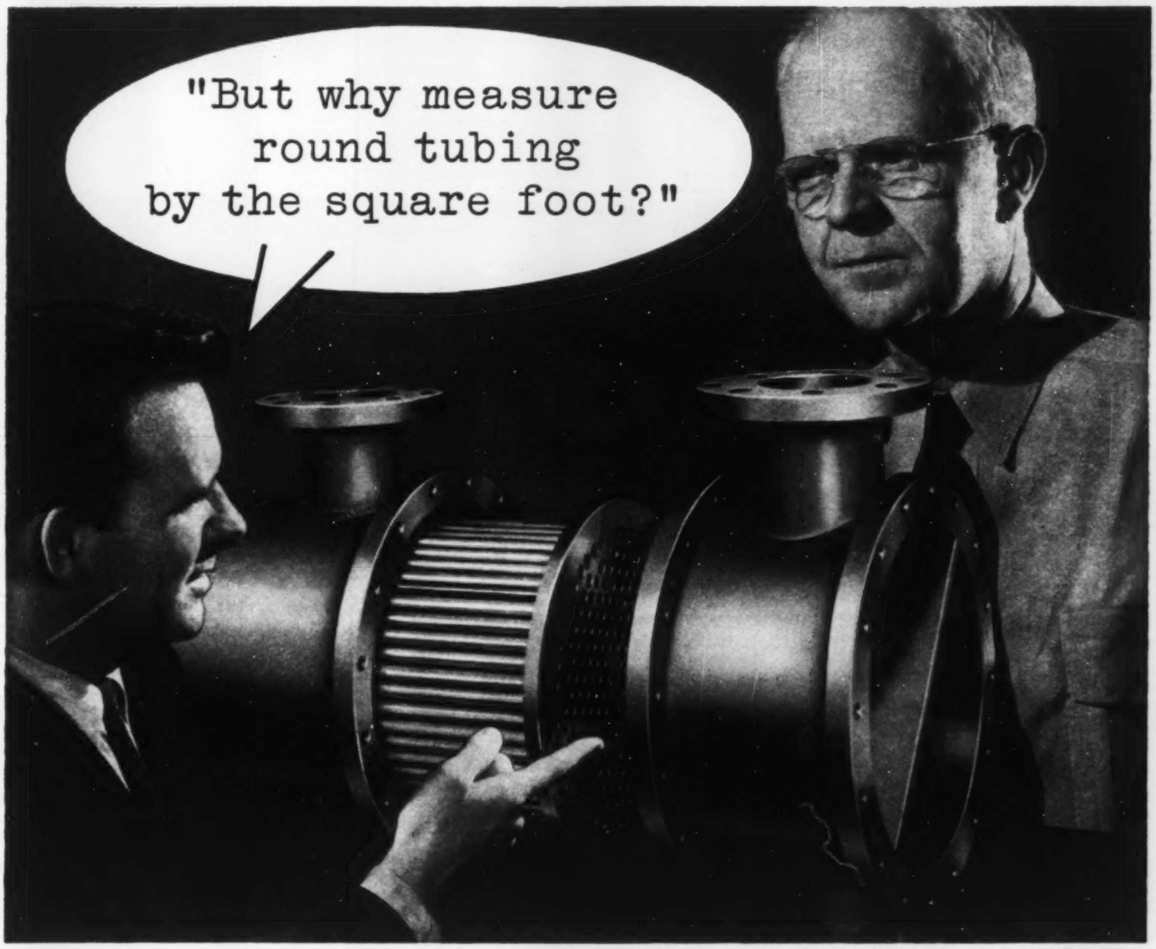

"But why measure round tubing by the square foot?"

Photo courtesy Ross Heat Exchanger Division of American-Standard, Buffalo, N.Y.

"Because Ross Heat Exchanger Division has to be able to tell its customers how much cooling surface they're getting. That's a vital factor in a heat exchanger."

"I get it. That's why they use so many small tubes, instead of a few large ones. And Superior supplies the tubing?"

"Right. Stainless is the most popular, in ⅜ in. or ⅝ in. OD. But they order other analyses, too. The tubing has to have thin walls to perform the heat exchange function efficiently. It has to be strong to withstand the system pressure. And it's got to have smooth, clean inner and outer surfaces to minimize any pressure drop. Finally, it has to be tough, yet ductile enough to make installation easy."

Lend an ear, Mr. Design Engineer. They're talking about Superior tubing. The unit under discussion is made by Ross Heat Exchanger Division of American-Standard, one of the leading heat exchanger manufacturers. Superior tubing gives them the quality and dependability they like to build into their products.

This is only one of the many applications of Superior tubing in industry. We offer a wide range of tubing sizes in over 63 analyses, including stainless, carbon and alloy steels, nickel and nickel alloys, beryllium copper, titanium and zirconium.

Let us help you with *your* tubing problems. Our years of experience and our extensive facilities are at your service. For more technical information, write Superior Tube Company, 2005 Germantown Ave., Norristown, Pa., for your free copy of Bulletin No. 40.

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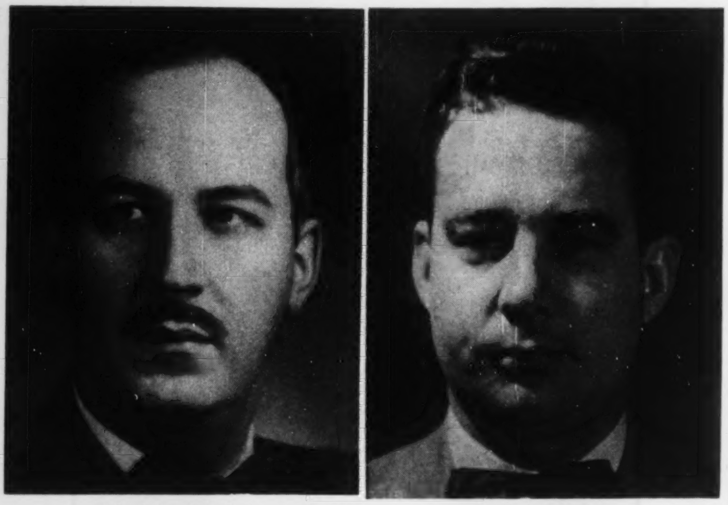
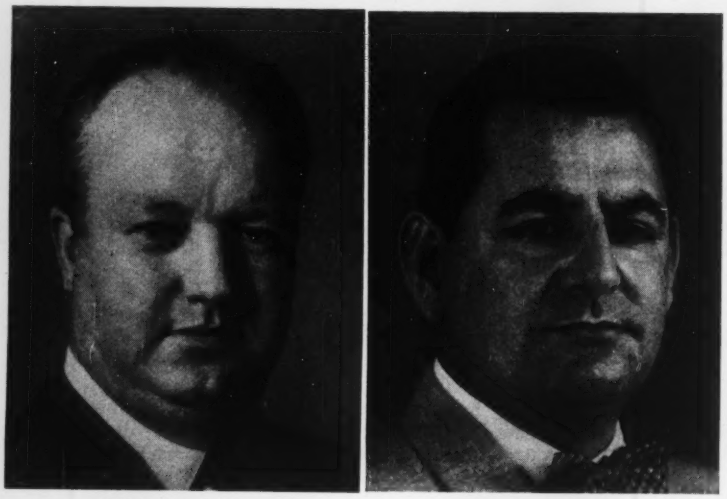
MEN OF INDUSTRY



DR. R. B. CORBETT

J. M. FORD

. . . appointments at Midvale-Heppenstall Co.



JOHN W. HORNSBY

GERALD T. SMITH

. . . executive posts at New York Shipbuilding Corp.

C. J. Parks replaces Mr. Stollenmeyer as plant manager at Cleveland.

Paul L. Arnold succeeds **C. R. Tinsley,** retired, as resident manager of the Decoto, Calif., plant of **United States Pipe & Foundry Co.** He was resident manager of the Chattanooga, Tenn., plant, and is succeeded by **Howard M. Barker,** Chattanooga production superintendent.

Ralph E. Bond was made deputy general manager - administration at **American Machine & Foundry Co.'s** electronics division, Boston.

New York Shipbuilding Corp., Camden, N. J., elected **John W. Hornsby** executive vice president; **Gerald T. Smith,** vice president-purchasing; **John B. Letherbury,** vice president-engineering; **Harold M. Sandberg,** vice president-estimating.

Rine Kruger Jr. was named assistant chief engineer for **Delco-Remy Division,** General Motors Corp., Anderson, Ind.

A. R. Matthews was elected president, **Pittsburgh Consolidation Coal Co.,** Pittsburgh. He succeeds **George H. Love,** now chairman.

Dr. R. B. Corbett was made director of metallurgy and **J. M. Ford** superintendent of the consumable electrode vacuum melting department of **Midvale-Heppenstall Co.,** Philadelphia, subsidiary of Heppenstall Co.

Bill Murray was made assistant sales manager, **Owatonna Tool Co.,** Owatonna, Minn.

John D. Ricards was elected executive vice president, **Wm. H. Muller & Co. Inc.,** New York. **Enoch Perkins** was elected a vice president. He was a vice president, Mutual Chemical Division, Allied Chemical & Dye Corp.

Massey-Harris-Ferguson Ltd., Toronto, Ont., elected **Albert A. Thornbrough** president. He was named executive vice president in 1955 and was placed in direct charge of the parent company and its subsidiaries last July after resignation of James S. Duncan as chairman and president.

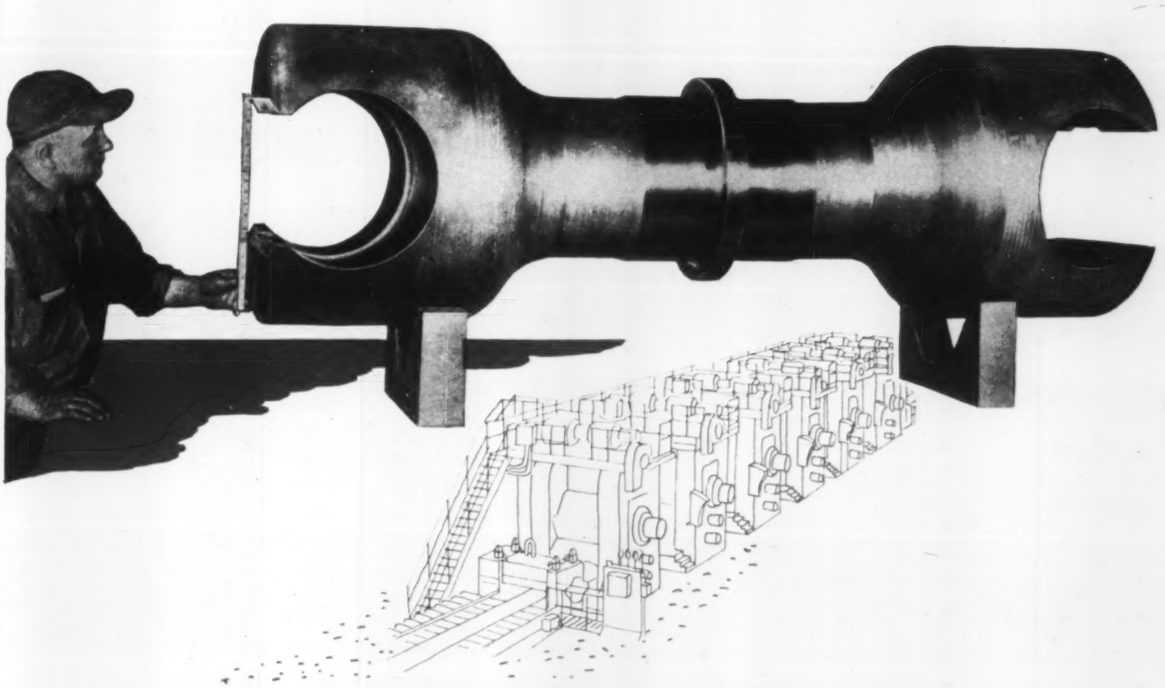
Alfred J. Olson was named general sales manager, Chicago plant, **Joseph T. Ryerson & Son Inc.** He is succeeded as sales manager by **Robert A. Daggit** and **Scott Vrooman,** formerly assistant sales managers, each assigned districts in the Chicago area.

Frank S. Treco Jr. was made sales manager, **Clevite Harris Products Inc.,** Cleveland. A sales engineer in Detroit, he is replaced by **Ralph E. Koldhoff.**

Frederick W. Bonacker, assistant vice president and sales manager, bonded abrasives division, **Carborundum Co.,** Niagara Falls, N. Y., has assumed administrative duties in the office of the president. **Frederick W. Scott** succeeds Mr. Bonacker as sales manager, bonded abrasives division, and is replaced by **Harold C. Smith** as manager of the merchandising branch of the division.

Viking Steel Co., Cleveland, elected **Bailey I. Ozer** executive vice president; **Richard S. Adler,** vice president-sales; **Adam B. Koblitz,** vice president; **Joseph J. Moore,** vice president.

James M. Roche was elected vice president and general manager, **Cadillac Motor Car Division,** Gen-



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Strip mills do!

They increase life and therefore reduce "down time" with Finkl finish machined spindles, once again proving that the best costs the least in the long run.

A typical example is this 98″ spindle, weighing 5900 pounds, which began as a 13,000 pound forging from a 50,000 pound ingot out of our own melt shop. The utmost consideration for the spindle's end use set up the quality control program before the furnace electrodes started to arc. Then through forging, heat treating, rough and finish machining, and final inspection, each department head and his crew of craftsmen guided the program to its specified completion.

When you are considering cylinders, spindles, driveshafts, or any special purpose forging, whether rough turned or finish machined, call your local Finkl representative. He will be glad to help you plan, or call upon the more than 78 years of Finkl experience to save you money and give you the finest forgings, or die blocks, available.

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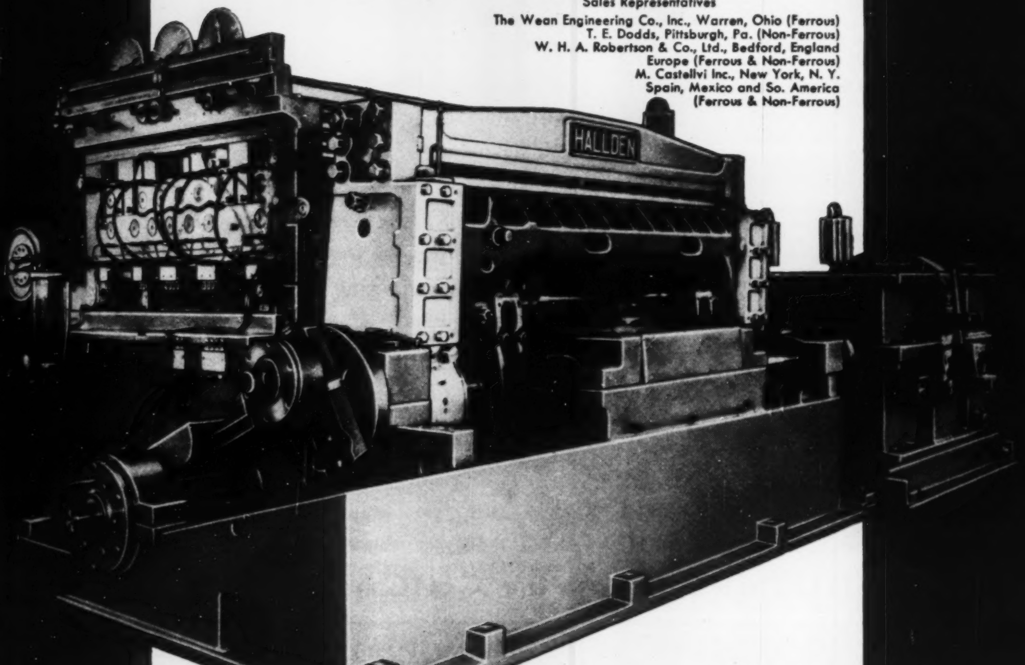
Spain, Mexico and So. America
(Ferrous & Non-Ferrous)



ERWIN J. KAISER GEORGE K. CASSADY GUY E. LINGENFELTER

. . . administrative changes at Giddings & Lewis Machine Tool

eral Motors Corp., Detroit. He succeeds **Don E. Ahrens,** retired.

S. George Lawson was made operations manager of photoflash and incandescent lamps, lighting division, **Sylvania Electric Products Inc.,** at Salem, Mass.

Frank E. Batson was made manager of quality control for the home appliance division of **Servel Inc.,** Evansville, Ind. He succeeds **Edward J. Cassidy,** recently made manager of the defense division.

Edward J. Mytkowicz was appointed manager of operations for Jones Machinery Division, **Hewitt-Robins Inc.,** Chicago. He was manager of manufacturing at Hewitt-Robins' plant in Passaic, N. J.

Joseph V. Falcon was elected president - general manager, **Savage Arms Corp.,** Utica, N. Y. He succeeds **Frederick F. Hickey,** resigned for reasons of health. **O. M. Knode Jr.** replaces Mr. Falcon as vice president and assistant general manager.

William S. Ginn and **Jack S. Parker** were elected vice presidents of **General Electric Co.** Mr. Ginn is general manager, transformer division at Pittsfield, Mass. Mr. Parker is general manager, aircraft gas turbine division, Cincinnati.

Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., named **Erwin J. Kaiser** staff vice president-manufacturing. He is succeeded as general manager of the Davis Boring Tool Division by **George K. Cassady,** former sales manager of the G&L and Hypro Division. **Guy E. Lingenfelter,** assistant sales manager, succeeds Mr. Cassady.

Bernard S. Reckseit was made chief engineer of **Ransohoff Inc.,** Hamilton, O. He joined the firm in 1947 as engineering assistant to the president, and assumed his new post following the death of **Nathan Ransohoff,** founder, chairman and chief engineer.

E. C. Fales, executive vice president, **Gunite Foundries Corp.,** Rockford, Ill., was elected president-general manager. **Duncan P. Forbes,** former president, becomes chairman.

Charles Liechti was made chief engineer, technical services, **Eutectic Welding Alloys Corp.,** Flushing, N. Y.

BERNARD S. RECKSEIT

. . . chief engineer at Ransohoff Inc.

CHARLES LIECHTI

. . . chief engineer at Eutectic Welding

The Big Trend in Metalworking...

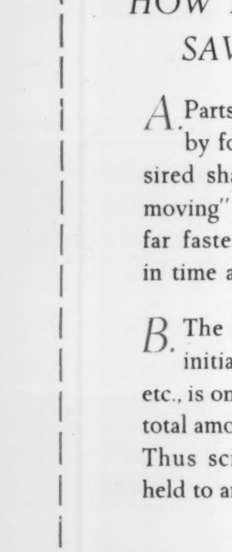
MOVE the metal ...it's cheaper than

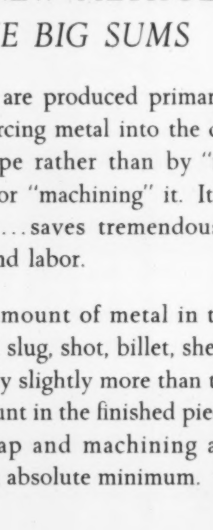
HOW NEW METHODS SAVE BIG SUMS

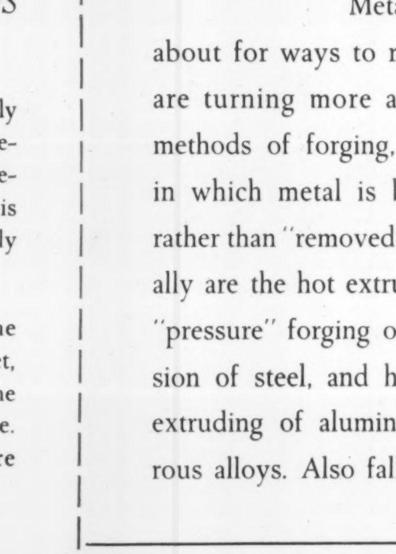
A. Parts are produced primarily by forcing metal into the desired shape rather than by "removing" or "machining" it. It is far faster... saves tremendously in time and labor.

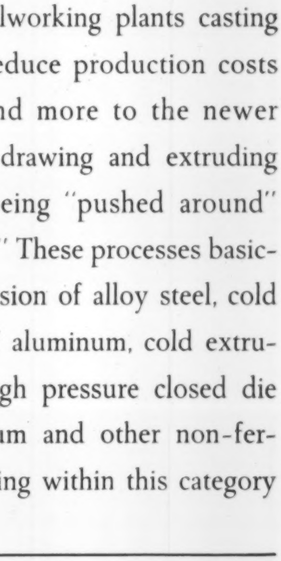
B. The amount of metal in the initial slug, shot, billet, sheet, etc., is only slightly more than the total amount in the finished piece. Thus scrap and machining are held to an absolute minimum.

Metalworking plants casting about for ways to reduce production costs are turning more and more to the newer methods of forging, drawing and extruding in which metal is being "pushed around" rather than "removed." These processes basically are the hot extrusion of alloy steel, cold "pressure" forging of aluminum, cold extrusion of steel, and high pressure closed die extruding of aluminum and other non-ferrous alloys. Also falling within this category


Closed die extruding of heated aluminum reduced production time 99%.


Cold steel extrusion reduced scrap 43%


Hot alloy steel extrusion is now an established art.


Metal powder parts are often produced with no machining.

● *New and improved production techniques save millions...arouse widespread interest*

1. Actual parts production is cut from hours in typical cases to minutes or even seconds.
2. Pieces generally have superior finish and improved physicals including grain structure.
3. Tolerances and uniformity equal or better those of older methods.
4. Scrap is greatly reduced and in many cases practically eliminated.
5. Unit costs go way down.

REMOVING it!

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are somewhat older though greatly changed and improved methods for the extrusion of aluminum, hot forging of ferrous metals, powder metallurgy, deep drawing of sheet and die casting. The most recent developments involve variations and combinations of the above applied to many products and materials. Our engineers are in close daily contact with these developments. They'll be glad to help apply any of them to your production. Call or write us.

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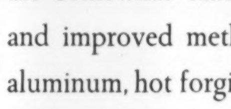
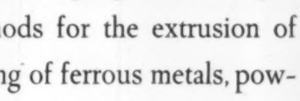


New developments in steel forging have greatly expanded its application.



Non-ferrous extrusion installations now embrace titanium, magnesium and newer metals.

Production rates of die cast aluminum and zinc parts have been upped 20% to 30%.

● *"MOVE the METAL" is NOT NEW...*

When this advertisement first appeared several years ago, it apparently sparked the current recognition of the "Move Metal" idea. Today the practice is widely accepted, acclaimed and growing. As the leader in the movement, Lake Erie will gladly share its experience with you.

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How to pick the 1 tubing steel out of 24 to give you longest tube life per dollar

Ask the experts!

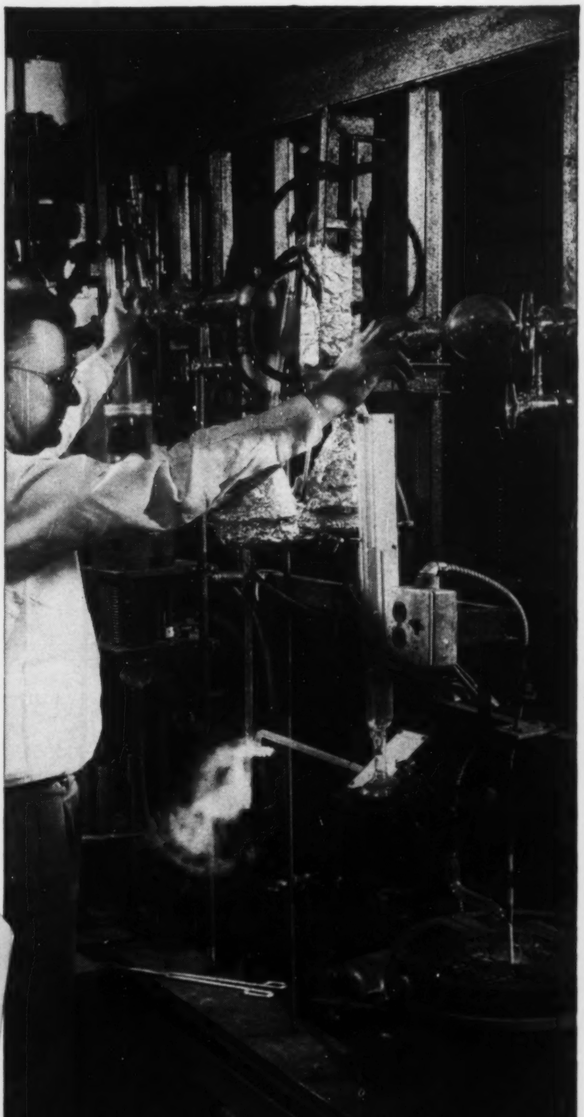
OF THE 24 different high-temperature tube steels the Timken Company offers to solve your heat, pressure, corrosion and oxidation problems, *one* analysis is most exactly suited to your particular needs, to give you maximum tube life per dollar of cost.

To find this analysis, *ask the experts.*

These experts are the metallurgists of The Timken Roller Bearing Company. The benefit of their more than 20 years of steel research and experience—with emphasis on high-temperature steels—is yours for the asking. They'll help you select the analysis that will give you longest tube life for your money—the only true measure of actual tube steel cost.

Whichever analysis you choose, you can be confident of uniform quality. The Timken Company maintains rigid quality control from melt shop through final inspection.

Why not let the Timken Company's metallurgists help pick the tubing steel that can solve *your* problem? *Ask the experts!* The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".



To help control exact steel analysis, a steel sample is melted in this vacuum fusion apparatus. Then gases are pumped out, and the amount present in the steel is determined.

This month's report is on:

18-8 STAINLESS

An austenitic, non-magnetic alloy that shows the best combination of creep strength, oil corrosion resistance and oxidation resistance for service up to 1500°F. For use in oil cracking systems, hydrogenation equipment, high temperature oil and steam piping, superheater elements, heat exchangers.

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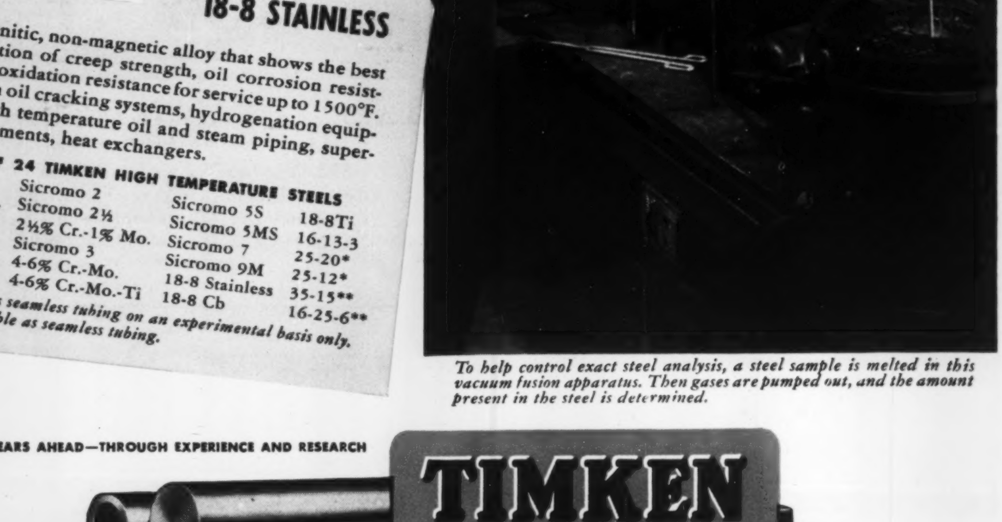
2% Cr.-Mo.
Sicromo 2
Sicromo 2½
2½% Cr.-1% Mo.
Sicromo 3
4-6% Cr.-Mo.
4-6% Cr.-Mo.-Ti
Sicromo 5S
Sicromo 5MS
Sicromo 7
Sicromo 9M
18-8 Stainless
18-8 Cb
18-8Ti
16-13-3
25-20*
25-12*
35-15**
16-25-6**

* *Available as seamless tubing on an experimental basis only.*
** *Not available as seamless tubing.*

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH



SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

JANUARY 7, 1957

FACTS and FIGURES

of the metalworking industry

This is the ninth annual edition of Metalworking Facts and Figures. In this 48-page section are the figures you need on production, sales, labor, prices and earnings in metalworking—the world's biggest industry. Compiled by STEEL, Penton Building, Cleveland 13, O.

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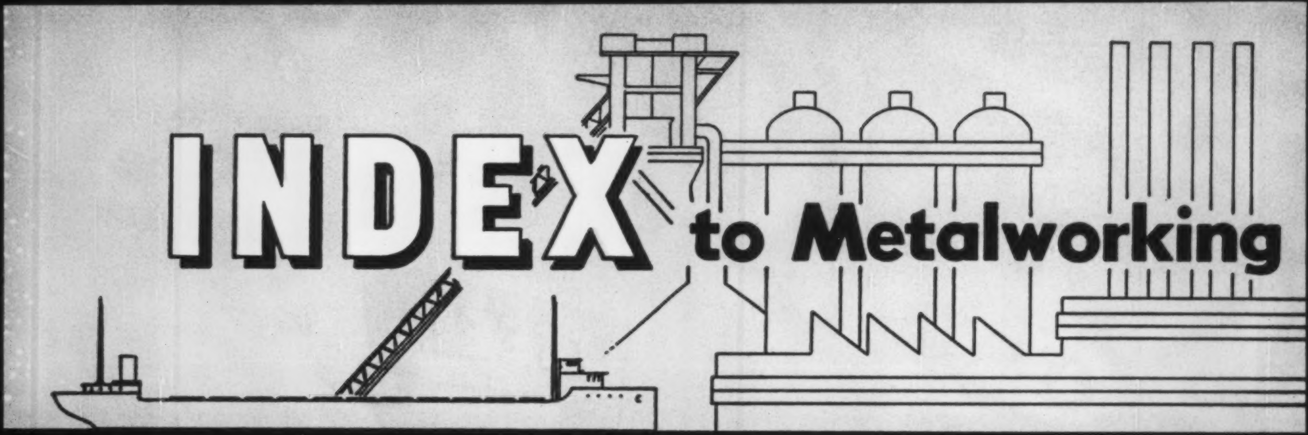

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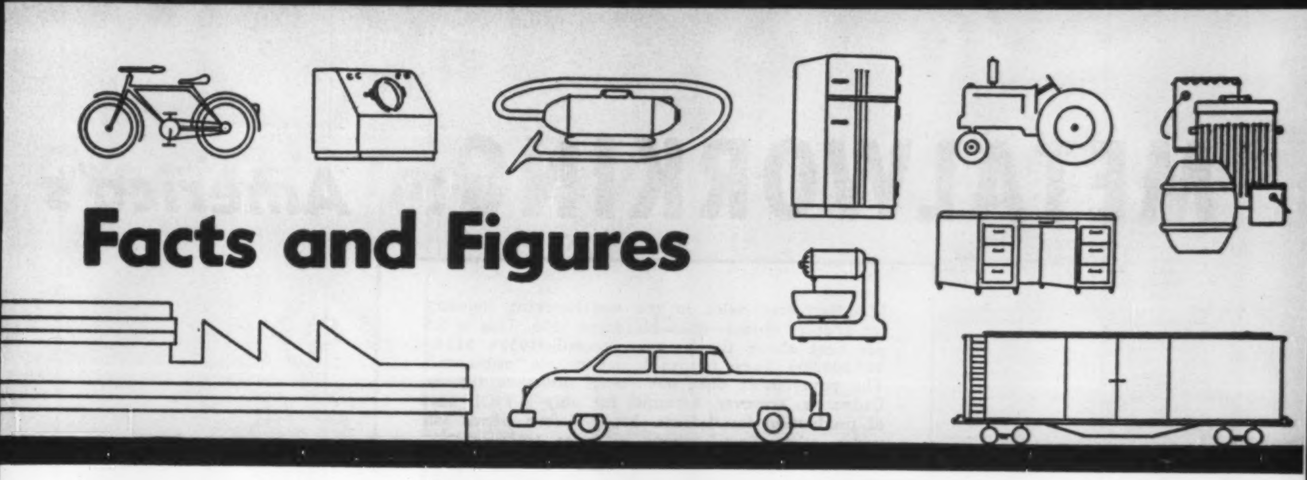

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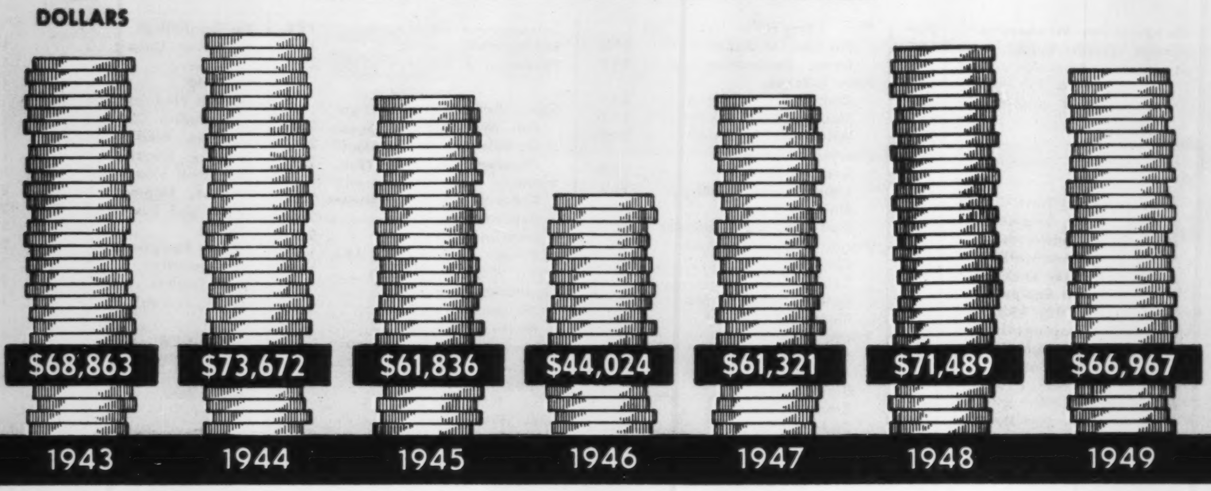
METALWORKING: America's

Manufacturers' sales in the metalworking industry set another record—$135 billion in 1956. This is 5.5 per cent above the previous record—1955's $128,025,000,000. These figures do not include "ordnance." The government does not reveal ordnance figures. Ordnance, however, accounts for only a small part of production for defense. Many defense items fall under other classifications, such as transportation equipment or instruments. Data are from the Office of Business Economics, U. S. Department of Commerce, with 1956 estimated by STEEL.



MANUFACTURERS' SALES IN METALWORKING INDUSTRY†

(Millions of Dollars)

New Standard Industrial Classifications	Primary Metals	Fabricated Metal Products	Machinery	Transportation Equipment	Instruments	TOTAL Metalworking Industry
1956*	28,428	17,575	47,043	38,330	3,624	135,000
1955	26,407	16,043	40,802	41,112	3,661	128,025
1954	19,749	13,862	37,775	32,283	3,120	106,789
1953	24,043	15,004	41,580	37,958	3,208	121,793
1952	20,725	13,625	38,402	29,582	2,886	105,220
1951	23,087	13,655	33,989	25,606	2,702	99,039
1950	19,046	11,710	27,114	22,651	2,486	83,007
1949	14,743	9,160	22,369	18,717	1,978	66,967
1948	17,153	10,200	24,618	17,475	2,043	71,489

Former Industry Group Classifications	Iron-Steel and Products	Nonferrous Metals and Products	Electrical Mach. and Equipment	Machinery Except Electrical	Automobiles and Equipment	Trans. Equip. Except Automobiles	TOTAL Metalworking Industry
1948	22,188	5,946	9,024	15,658	13,662	3,818	70,296
1947	19,172	5,633	8,299	13,697	11,478	3,042	61,321
1946	14,202	4,705	5,658	9,824	6,624	3,011	44,024
1945	16,812	4,463	6,302	11,640	11,446	11,173	61,836
1944	17,795	4,755	7,104	12,907	15,096	16,015	73,672
1943	16,772	4,595	5,734	12,286	13,422	16,054	68,863

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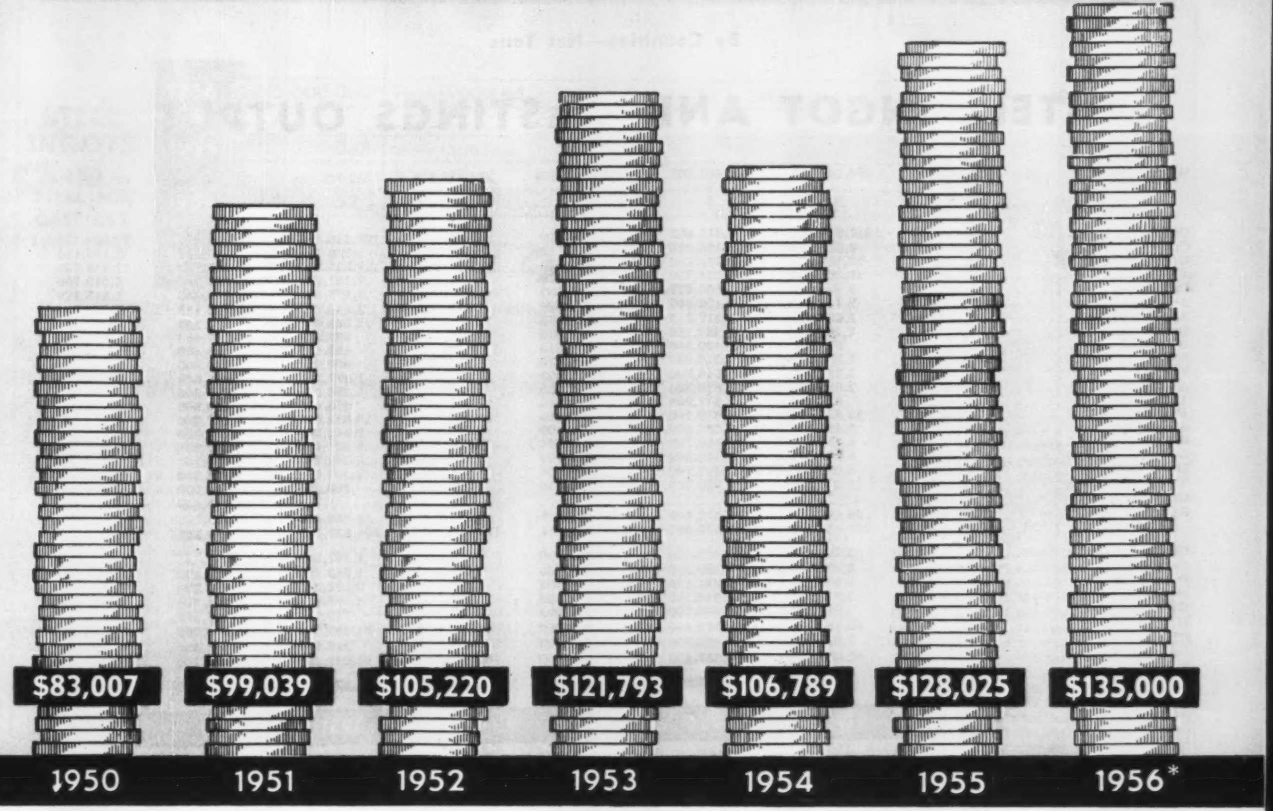
†Figures for 1948 and later represent a shift to the Standard Industrial Classification system. Data for 1948 are presented on the old industry group classification as well as the new. Figures for 1948 and later are not adjusted for seasonal variation.

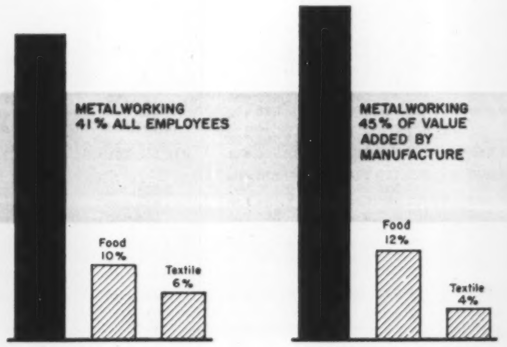
*Estimate for 1956 is by STEEL. Figures for other years (except instruments) are from Office of Business Economics. Instruments figures for 1950 through 1956 are estimated by STEEL.

Greatest Industry



*Estimated.

HOW METALWORKING TOWERS OVER OTHER MANUFACTURING INDUSTRIES



Standard Industrial Classifications	TOTAL NUMBER PLANTS	NUMBER OF EMPLOYEES	VALUE Added by Manufacture (Millions)
20. Food and Kindred Products	42,443	1,652,190	$13,453
21. Tobacco Manufactures	636	94,558	988
22. Textile Mill Products	8,082	1,023,462	4,672
23. Apparel and Related Products ..	31,334	1,197,722	5,033
24. Lumber and Products	41,513	648,043	3,178
25. Furniture and Fixtures	10,302	340,261	1,952
26. Paper and Allied Products	4,985	528,853	4,542
27. Printing and Publishing	32,572	803,502	6,194
28. Chemicals and Allied Products ..	11,421	745,695	9,150
29. Petroleum and Coal Products ..	1,433	216,378	2,569
30. Rubber Products	1,426	248,367	1,903
31. Leather and Leather Products ..	4,822	356,225	1,637
32. Stone, Clay and Glass Products .	11,232	492,985	3,810
33. Primary Metal Industries	**5,843**	**1,115,577**	**9,405**
34. Fabricated Metal Products	**22,592**	**1,024,559**	**7,766**
35. Machinery (except Electrical) ..	**25,737**	**1,549,823**	**12,313**
36. Electrical Machinery	**5,820**	**952,207**	**7,399**
37. Transportation Equipment	**5,459**	**1,710,866**	**13,734**
38. Instruments	**3,407**	**274,484**	**2,104**
Total Metalworking Industry .	**68,858**	**6,627,516**	**$52,721**
39. Miscellaneous Manufactures	17,075	707,560	4,199
Administrative and Auxiliary	4,190	469,773	......

1954 Census of Manufactures.

World Production

METALWORKING FACTS AND FIGURES

By Countries—Net Tons

STEEL INGOT AND CASTINGS OUTPUT

	1956 a	1955	1954	1953	1952	1951	1950	1949
World Total	310,048,000	296,107,695	245,692,102	258,152,924	233,028,459	232,179,538	208,102,045	177,636,876
United States	115,000,000	117,036,085	88,311,652	111,609,719	93,168,039	105,199,848	96,836,075	77,978,176
Canada	5,250,000	4,529,280	3,195,025	4,116,110	3,703,050	3,568,770	3,383,520	3,190,430
Great Britain	23,000,000	22,165,470	20,742,400	19,721,520	18,388,050	17,515,120	18,247,825	17,419,250
Japan	11,700,000	10,365,600	8,524,990	8,428,420	7,687,240	7,151,980	5,322,900	3,549,700
India	1,940,000	1,908,480	1,886,975	1,687,280	1,767,580	1,679,660	1,610,335	1,515,360
Australia	2,780,000	2,471,840	2,486,400	2,294,880	1,817,760	1,649,870	1,395,185	1,341,650
South Africa	1,710,000	1,680,000	1,517,710	1,367,855	1,325,630	1,045,070	832,385	804,100
Brazil	1,360,000	1,282,600	1,263,130	1,117,930	982,630	927,300	867,460	676,610
Mexico	605,000	577,920	499,840	508,310	559,350	498,410	240,460	379,610
Spain	1,340,000	1,333,640	1,210,000	983,730	998,030	900,020	899,800	791,560
Sweden	2,430,000	2,363,900	2,048,200	1,960,200	1,857,900	1,677,500	1,604,900	1,530,100
Austria	2,180,000	2,010,800	1,818,300	1,411,520	1,162,700	1,130,580	1,037,300	918,060
Yugoslavia	990,000	886,600	677,600	566,500	486,200	473,000	470,800	438,900
France (d)	14,700,000	13,851,200	11,689,700	10,996,700	11,953,700	10,818,500	9,517,200	10,672,200
Saar (d)	3,700,000	3,481,500	3,085,500	2,952,400	3,105,300	2,863,300	2,087,800	1,932,700
Belgium (d)	7,000,000	6,481,200	5,485,700	4,986,300	5,592,400	5,577,000	4,167,900	4,252,600
Luxembourg (d)	3,800,000	3,547,500	3,110,800	2,924,900	3,302,200	3,384,700	2,696,100	2,499,200
Italy (d)	6,500,000	5,934,500	4,627,700	3,850,000	3,888,500	3,307,590	2,555,300	2,260,500
The Netherlands (d)..	1,160,000	1,070,520	1,020,360	945,450	753,500	608,300	539,000	470,470
Germany	....	....	....	....	....	....	14,427,600	11,611,600
Germany, West. Zone (d)	25,700,000	23,469,600	19,177,400	16,962,000	17,386,600	14,856,600	....	....
Free World Total.	232,845,000	226,448,235	182,379,382	199,391,724	179,886,359	184,833,118	168,739,845	144,232,776
Germany, Soviet Zone.	3,200,000	2,758,800	2,454,100	2,394,700	2,082,300	1,707,200	....	....
Czechoslovakia	5,500,000	4,923,600	4,699,200	4,873,000	4,169,000	3,643,200	3,312,100	3,038,200
Poland	5,360,000	4,369,260	4,344,120	3,964,400	3,501,300	3,071,200	2,766,500	2,533,300
Hungary	1,850,000	1,793,000	1,640,100	1,697,300	1,535,600	1,357,400	1,124,200	933,900
Rumania	880,000	841,500	689,700	790,900	767,800	710,600	613,800	504,900
U.S.S.R.	53,700,000	49,789,300	45,577,400	41,800,000	37,950,000	34,540,000	30,030,000	25,600,000
China	4,900,000	3,058,000	2,452,800	1,945,900	1,644,500	990,000	798,600	173,800
Iron Curtain Total	75,390,000	68,033,460	61,857,420	57,466,200	51,650,500	46,019,600	38,645,200	32,784,100
Other Countries (b) ..	1,813,000	1,626,000	1,455,300	1,295,000	1,491,600	1,326,820	717,000	620,000

(a) Estimated.
(b) Countries producing less than 500,000 tons annually.
(c) Rumania included in "Other Countries" prior to 1953.
(d) Member of European Coal & Steel Community.

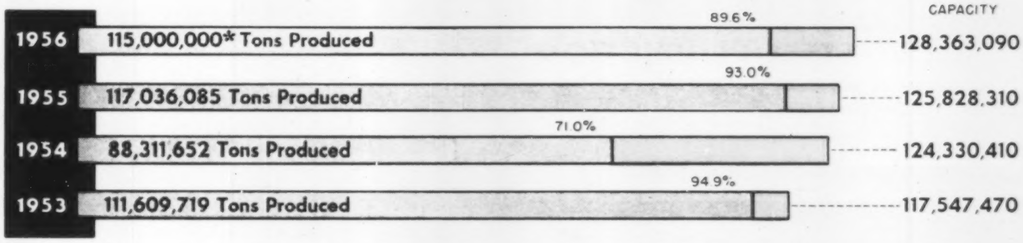
PIG IRON AND FERROALLOYS OUTPUT

(Includes ferroalloys made in electric furnaces, where available)

	1956a	1955	1954	1953	1952	1951	1950	1949
World Total	217,020,000	211,346,175	174,522,666	184,986,868	168,030,620	165,578,353	147,204,201	127,684,375
United States	75,400,000	79,263,865	59,806,242	77,250,168	63,353,955	72,448,543	66,400,311	54,916,785
Canada	3,700,000	3,213,280	2,309,776	3,165,905	2,913,680	2,812,540	2,497,600	2,356,480
Great Britain	14,600,000	13,966,400	13,309,408	12,515,775	12,015,025	10,829,050	10,788,850	10,638,320
Japan	6,350,000	5,750,080	5,069,130	4,969,910	3,821,620	3,550,000	2,528,680	1,740,480
India	2,150,000	2,121,280	2,197,440	1,989,455	2,075,360	2,016,110	1,880,370	1,804,320
Australia	2,050,000	2,009,280	2,083,200	1,894,705	1,718,080	1,470,900	1,229,870	1,170,400
South Africa	1,400,000	1,387,680	1,319,360	1,347,360	1,244,320	866,880	807,850	780,980
Brazil	1,250,000	1,181,400	1,197,790	974,600	892,650	848,760	801,900	562,870
Spain	1,050,000	1,093,620	998,580	910,470	870,540	719,400	733,700	676,000
Sweden	1,450,000	1,361,800	1,101,320	1,163,140	1,213,300	936,100	931,150	945,670
Austria	1,830,000	1,659,350	1,489,290	1,456,180	1,291,840	1,153,900	971,410	921,470
France (d)	12,500,000	12,196,800	9,835,100	9,634,900	10,745,900	9,625,000	8,537,100	9,179,500
Saar (d)	3,350,000	3,166,900	2,746,700	2,620,200	2,805,000	2,605,900	1,850,200	1,740,200
Belgium (d)	6,300,000	5,929,000	5,087,500	4,639,800	5,269,000	5,335,000	4,064,500	4,123,900
Luxembourg (d)	3,600,000	3,393,500	3,081,100	2,990,900	3,383,600	3,472,700	2,748,900	2,609,200
Italy (d)	2,200,000	1,907,400	1,480,600	1,475,100	1,325,500	1,110,450	482,790	448,800
The Netherlands (d)..	740,000	737,440	671,550	650,100	592,570	576,400	499,620	477,400
Germany	....	....	....	....	....	....	10,791,000	8,404,000
Germany, West. Zone (d)	19,400,000	18,230,300	13,839,100	12,883,200	14,253,800	11,766,700	....	....
Free World Total.	159,320,000	158,569,375	127,623,186	142,531,868	129,785,740	132,144,333	118,545,801	103,496,775
Germany, Soviet Zone.	1,900,000	1,667,600	1,450,000	1,174,800	716,100	375,100	....	....
Czechoslovakia	3,700,000	3,280,000	3,062,400	3,069,000	2,563,000	2,370,500	2,257,200	2,071,000
Poland	3,600,000	3,423,200	2,929,080	2,528,900	1,960,200	1,734,700	1,636,800	1,367,000
Hungary	950,000	940,500	902,000	787,600	632,500	556,600	550,000	473,000
Rumania (c)	650,000	632,500	475,200	501,600	....	....	....	....
U.S.S.R.	40,000,000	36,630,000	32,970,000	30,250,000	27,720,000	24,310,000	21,340,000	18,500,000
China	4,500,000	4,048,000	3,385,800	2,443,100	2,583,900	2,200,000	1,374,400	246,600
Iron Curtain Total	55,300,000	50,621,800	45,174,480	40,755,000	36,175,700	31,546,900	27,158,400	22,657,600
Other Countries (b) ..	2,400,000	2,155,000	1,725,000	1,700,000	2,069,180	1,887,120	1,500,000	1,530,000

Production-Capacity

METALWORKING FACTS AND FIGURES



STEEL INGOTS AND STEEL FOR CASTINGS (Net Tons)

ANNUAL STEEL CAPACITY AND PRODUCTION BY PROCESSES

	Open-hearth		Bessemer		Crucible		Electric		TOTAL		Per Cent
	Capacity	Production	Capacity	Production	Capacity	Production	Capacity	Production	Capacity†	Production	Capacity
1956.....	112,317,040	....	4,787,000	....	40	....	11,259,010	....	128,363,090	115,000,000	89.6*
1955.....	110,234,160	105,359,417	4,787,000	3,319,517	40	‡	10,807,110	8,357,151	125,828,310	117,036,085	93.0
1954.....	109,094,730	80,327,494	4,787,000	2,548,104	40	‡	10,448,640	5,436,054	124,330,410	88,311,652	71.0
1953.....	102,677,980	100,473,823	4,637,000	3,855,705	40	‡	10,232,450	7,280,191	117,547,470	111,609,719	94.9
1952.....	94,973,780	82,846,439	5,381,000	3,523,677	40	‡	8,232,850	6,797,923	108,587,670	93,168,039	85.8
1951.....	91,054,020	93,166,518	5,621,000	4,890,946	20	‡	7,554,610	7,142,384	104,229,650	105,199,848	100.9
1950.....	86,984,490	86,262,509	5,537,000	4,534,558	20	‡	6,871,290	6,039,008	99,392,800	96,836,075	96.9 #
1949.....	84,817,040	70,248,803	5,191,000	3,946,656	20	‡	6,112,870	3,782,717	96,120,930	77,978,176	81.1
1948.....	83,610,690	79,340,157	5,226,000	4,243,172	20	‡	5,396,750	5,057,141	94,233,460	88,640,470	94.1
1947.....	81,010,990	76,873,793	5,154,000	4,232,543	20	‡	5,076,240	3,787,735	91,241,250	84,894,071	93.0
1946.....	81,236,250	60,711,963	5,154,000	3,327,737	20	‡	5,500,290	2,563,024	91,890,560	66,602,724	72.5
1945.....	84,171,590	71,939,602	5,874,000	4,305,318	3,800	24	5,455,890	3,456,704	95,505,280	79,701,648	83.5
1944.....	82,223,610	80,363,953	6,074,000	5,039,923	3,800	25	5,350,880	4,237,699	93,652,290	89,641,600	95.5 #
1943.....	79,180,880	78,621,804	6,553,000	5,625,492	3,800	146	4,554,980	4,589,070	90,292,680	88,836,512	98.1 #
1942.....	78,107,260	76,501,957	6,721,400	5,553,424	3,800	2,010	3,737,510	3,974,540	88,569,970	86,031,931	96.8 #
1941.....	74,565,510	74,389,619	6,996,520	5,578,071	3,942	2,313	2,586,320	2,869,256	84,152,292	82,839,259	97.3 #
1940.....	73,721,592	61,573,083	6,009,920	3,708,573	5,354	1,024	1,882,630	1,700,006	81,619,496	66,982,686	82.1
1939.....	72,959,638	48,409,800	7,138,880	3,358,916	5,354	931	1,725,086	1,029,067	81,828,958	52,798,714	64.5
1938.....	71,472,370	29,080,016	7,212,800	2,106,340	9,610	7	1,490,858	565,627	80,185,638	31,751,990	39.6
1937.....	69,725,736	51,824,979	7,084,000	3,863,918	11,850	1,046	1,326,788	947,002	78,148,374	56,636,945	72.5
1936.....	68,946,829	48,760,463	8,058,400	3,873,472	11,850	914	1,147,221	865,150	78,164,300	53,499,999	68.4

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*Estimated by STEEL. †As of Jan. 1. ‡Included with electric steel. # Based on average annual capacity. American Iron & Steel Institute.

MONTHLY OUTPUT OF STEEL FOR INGOTS AND CASTINGS

	Open-hearth		Bessemer		Electric		Total		Calculated
	Net Tons	% Capac.	Net Tons	% Capac.	Net Tons	% Capac.	Net Tons	% Capac.	Net Tons Weekly
1956	....	....	......	....	......	....	....	....	....
10 Mos.	83,697,416	....	2,623,604	....	7,485,571	....	93,806,591	....	....
Jan.	9,676,151	101.4	323,235	79.5	828,845	86.7	10,828,231	99.3	2,444,296
Feb.	9,043,064	101.3	296,543	78.0	779,388	87.1	10,118,995	99.2	2,444,202
Mar.	9,795,263	102.7	310,060	76.3	819,465	85.7	10,924,788	100.2	2,466,092
Apr.	9,437,945	102.2	306,388	77.9	779,452	84.2	10,523,785	99.7	2,453,097
May	9,370,167	98.2	297,990	73.3	822,219	86.0	10,490,376	96.2	2,368,031
June	8,664,605	93.9	282,846	71.9	773,546	83.6	9,720,997	92.1	2,265,967
July	1,330,151	13.9	......	....	292,012	30.5	1,622,163	14.9	367,005
Aug.	7,213,274	75.6	189,564	46.6	719,759	75.3	8,122,597	74.5	1,833,543
Sept.	9,342,796	101.2	286,978	72.9	792,885	85.7	10,422,659	98.8	2,435,201
Oct.	9,824,000	103.0	330,000	81.2	878,000	91.8	11,032,000	101.2	2,490,000
Nov.	....	....	......	....	......	....	....	....	....
Dec.	....	....	......	....	......	....	....	....	....
1955	105,359,417	95.6	3,319,517	69.3	8,357,151	77.3	117,036,085	93.0	2,244,651
Jan.	8,054,345	86.0	199,229	49.0	584,162	63.6	8,837,736	82.7	1,994,974
Feb.	7,734,884	91.5	197,091	53.7	564,959	68.1	8,496,934	88.0	2,124,233
Mar.	9,060,026	96.7	255,493	62.8	666,235	72.6	9,981,754	93.4	2,253,218
Apr.	8,858,549	97.7	275,069	69.8	681,477	76.6	9,815,095	94.8	2,287,901
May	9,307,291	99.4	305,347	75.1	715,678	77.9	10,328,316	96.6	2,331,448
June	8,764,430	96.6	283,544	72.0	698,493	78.6	9,746,467	94.1	2,271,904
July	8,232,535	88.1	268,348	66.1	600,063	65.5	9,100,946	85.3	2,059,038
Aug.	8,600,612	91.8	298,972	73.5	694,961	75.7	9,594,545	89.7	2,165,812
Sept.	8,829,266	97.6	307,171	78.2	745,888	84.1	9,882,325	95.7	2,308,954
Oct.	9,369,704	100.0	330,150	81.2	801,196	87.3	10,501,050	98.2	2,370,440
Nov.	9,141,244	100.8	306,674	77.9	799,480	89.9	10,247,398	99.0	2,388,671
Dec.	9,406,531	100.7	292,429	72.1	804,559	87.8	10,503,519	98.5	2,376,362

American Iron & Steel Institute.

PIG IRON †

CAPACITY and PRODUCTION

Net Tons

	Capacity	Production	%
1956	85,485,230	75,400,000	88.2*
January		7,049,564	97.1
February		6,602,817	97.2
March		7,149,443	98.5
April		6,924,563	98.6
May		6,920,942	95.3
June		6,434,589	91.6
July		1,107,009	15.2
August		5,142,217	70.8
September		6,932,648	98.7
October		7,315,559	100.8
November		....	...
December		....	...
1955	83,971,100	77,789,684	92.6
1954	82,001,390	58,686,884	71.6
1953	79,380,240	75,856,872	95.6
1952	73,782,340	62,150,926	84.2
1951	72,471,780	71,227,750	98.3
1950	71,560,110	65,439,769	91.4
1949	70,541,850	54,175,534	76.8
1948	67,438,930	61,043,806	90.5
1947	65,709,200	59,314,348	90.3
1946	67,340,590	45,547,907	67.6
1945	67,313,890	54,166,482	80.5
1944	67,921,410	62,072,683	91.4
1943	64,188,220	61,920,314	96.5
1942	60,606,850	60,115,387	99.2
1941	57,774,640	56,070,506	97.1

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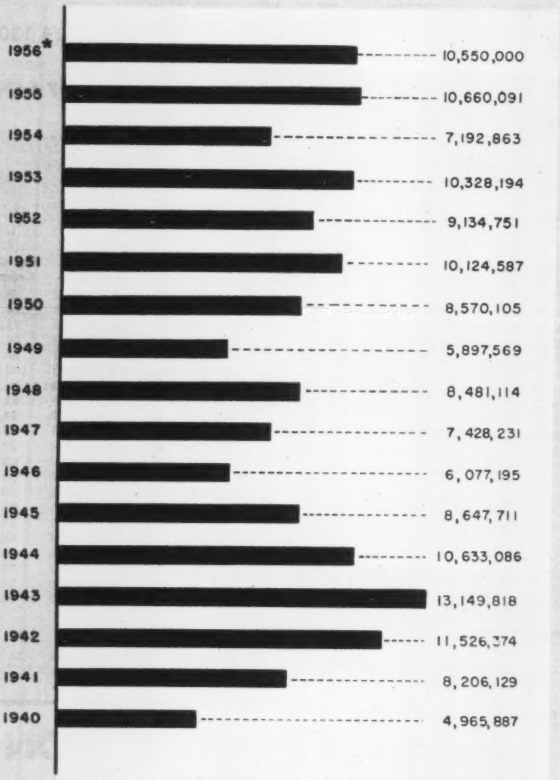
†Including ferroalloys made in blast furnaces. *Estimated by STEEL. American Iron & Steel Institute.

Ferrous Production

METALWORKING FACTS AND FIGURES

ALLOY STEEL PRODUCTION

Total Ingots and Castings—Net Tons



ALLOY STEEL PRODUCTION BY PROCESSES

(including stainless steel)

Ingots and Castings—Net Tons

	Open-Hearth					
	Basic	Acid	Total	Bessemer	Crucible	Electric
1956‡..	....	....	5,398,596	....	†	3,159,446
1955...	6,735,450	185,473	6,920,923	....	†	3,739,168
1954...	4,528,336	130,559	4,658,895	....	†	2,533,968
1953...	6,599,038	185,341	6,784,379	....	†	3,543,815
1952...	5,807,191	218,867	6,026,058	....	†	3,108,693
1951...	6,585,635	238,034	6,823,669	....	†	3,300,918
1950...	5,738,067	123,253	5,861,320	....	†	2,708,785
1949...	4,192,344	105,550	4,297,894	....	†	1,599,675
1948...	6,285,054	128,915	6,413,969	....	†	2,067,145
1947...	5,520,540	128,754	5,649,294	....	†	1,778,937
1946...	4,325,657	115,711	4,441,368	....	†	1,635,827
1945...	5,572,353	274,889	5,847,242	....	18	2,800,451
1944...	6,494,627	515,662	7,010,289	....	23	3,622,774
1943...	8,539,523	677,416	9,216,939	....	136	3,932,743
1942...	7,524,209	608,867	8,133,076	....	522	3,392,776
1941...	5,306,415	433,240	5,739,655	3,890	933	2,461,651
1940...	3,421,961	252,965	3.674.926	3,990	255	1,286,716

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*Estimated.
‡First ten months.
†Included with electric steel.
American Iron & Steel Institute.

Stainless Steel Production

Net Tons of Ingots

Type Number	9 Mos. 1956	12 Mos. 1955	Type Number	9 Mos. 1956	12 Mos. 1955
201	8,324	1,218	410	52,658	55,882
202	5,312	696	414	405	555
301	37,516	84.121	416	20,680	32,611
302	151,781	213.633	420	3,887	6,638
302B ...	430	1,505	430	172.147	360.521
303	25,504	33,915	430F ...	2,282	3,598
304	138,782	155.748	431	3.631	3,745
308	4.735	5,230	440A ...	1,820	2,267
309	6,642	7,724	440B ...	1.255	1,455
310	8,141	11.547	440C ...	2,090	2,274
316	52,352	60,225	442	531	1,147
321	33,789	35,944	443	120	395
347	10.295	10,042	446	1,778	3,268
403	19,682	23,591	All other	75,866	90,695
405	4,702	5,420			
406	2.609	2,603	Total ..	849.746	1.218.213

American Iron & Steel Institute.

High Speed and Tool Steel Bars

(Excluding Hollow Drill Steel)

Shipments—Net Tons

CLASS A HIGH SPEED STEEL

Grade	C (Min.)	Cr	W	Mo	V	Co (Min.)	10 Mos. 1956	12 Mos. 1955
		—(Maximum)—						
I	0.60	4.5	6.75	5.5	2.1 Max.	..	8,777	10,504
I-b	0.90	4.5	6.75	6.5	2.25 Min.	..	887	847
I-c	0.60	4.5	6.75	5.5	2.2 Max.	3.5	132	118
II	0.60	4.5	2.0	9.25	1.3 Max.	..	4,611	5,899
II-c	0.60	4.5	2.0	9.25	2.2 Max.	3.5	206	153
III	0.60	4.5	...	9.25	2.2 Max.	..	2,527	4,088
III-c	0.60	4.5	...	9.25	2.2 Max.	3.5	19	7
Total							17,159	21,616

CLASS B HIGH SPEED STEEL

Grade	C (Min.)	Cr	W	Mo	V	Co (Min.)	10 Mos. 1956	12 Mos. 1955
IV	0.55	4.5	19.0	...	1.3 Max.	..	2,119	2,366
IV-b	0.55	4.5	19.0	1.25	1.75 Min.	..	230	284
IV-c	0.55	4.5	22.0	1.25	2.2 Max.	3.5	690	695
Total							3.039	3,345

OTHER TOOL STEELS

		10 Mos. 1956	12 Mos. 1955
V	All hot-work steel	12,257	12,062
VI	High chromium (4% Cr minimum) die steels	10,413	10,488
VII	All other alloy tool steels	51,719	52,949
VIII	Carbon tool steels, excluding hollow drill steel	14,671	15,468
Total		89,060	90,967
Grand Total		109,258	115.928

American Iron & Steel Institute.

Steel Forgings

Shipments for Sale—Net Tons

1956	Drop and Upset	Press and Open Hammer	Total
Jan.	124,652	35,452	160,104
Feb.	118,138	33,584	151,722
Mar.	122,180	36,760	158,940
Apr.	114,782	35,224	150,006
May	111,970	38,598	150,568
June	103,371	40.071	143,442
July	76,240	22,221	98,461
Aug.	89,131	34,037	123,168
Sept.	88,203	33,267	121,470
Oct.	......	.....	......
Nov.	......	.....	......
Dec.	......	.....	......
1955	1,316,540	434,093	1,750.633
Jan.	102,976	32.960	135.936
Feb.	102,078	33.331	135.409
Mar.	119,186	35,244	154.430
Apr.	113,461	36,180	149.641
May	109.368	37,670	147.038
June	117.019	38,433	155,452
July	82,659	32,345	115,004
Aug.	99,904	34.898	134.802
Sept.	110.141	38,611	148.752
Oct.	119,975	38,014	157,989
Nov.	119.677	38,425	158.102
Dec.	120,096	37,982	158,078
1954	1,049,803	351.688	1,401.491
1953	1,477,290	563,656	2,040,946
1952	1,366,123	519,539	1,885,662
1951	1,323,713	503,093	1,826,806

U.S. Bureau of the Census.

Distribution

METALWORKING FACTS AND FIGURES

FINISHED STEEL DISTRIBUTION

By Market Classifications

(All Grades, Net Tons)	12 mos. 1956*	12 mos. 1955	12 mos. 1954	12 mos. 1953
Warehouses and Distributors	16,884,000	15,758,003	11,999,470	14,878,859
Automotive	13,860,000	18,721,880	11,792,989	14,663,775
Construction, including Maintenance	10,164,000	9,681,778	8,634,987	9,918,203
Containers	7,392,000	6,723,074	5,870,618	6,051,214
Machinery, Indus. Equip. & Tools.	5,040,000	4,699,026	3,517,038	4,328,604
Contractors' Products	4,200,000	3,982,161	2,969,812	3,324,218
Rail Transportation	4,200,000	3,520,849	2,457,297	4,787,830
Converters and Processors	4,032,000	3,753,381	2,452,703	3,513,976
Export	3.444,000	3,583,077	2,533,883	2,679,731
Electrical Machinery and Equip.	2,436,000	2,291,866	1,739,007	2,111,879
Other Domestic & Commercial Equip.	2,352,000	2,189,416	1,742,090	2,086,076
Appliances	2,268,000	2,199,114	1,441,461	2,045,749
Forgings (other than Automotive).	1,512,000	1,266,032	830,965	1,444,839
Bolts, Nuts, Rivets, Screws	1,428,000	1,475,340	964,483	1,341,606
Agricultural	1,176,000	1,336,886	1,189,199	1,233,247
Unclassified	1,008,000	919,154	675,019	937,853
Oil and Gas Drilling	840,000	792,767	585,562	755,714
Shipbuilding, Marine Equipment	756,000	601,234	501,231	872,209
Ordnance, Other Military	504,000	856,527	964,440	2,690,888
Mining, Quarrying, Lumbering	336,000	268,987	201,624	324,380
Aircraft	168,000	96,892	88,848	161,043
Total	84,000,000	84,717,444	63,152,726	80.151,893

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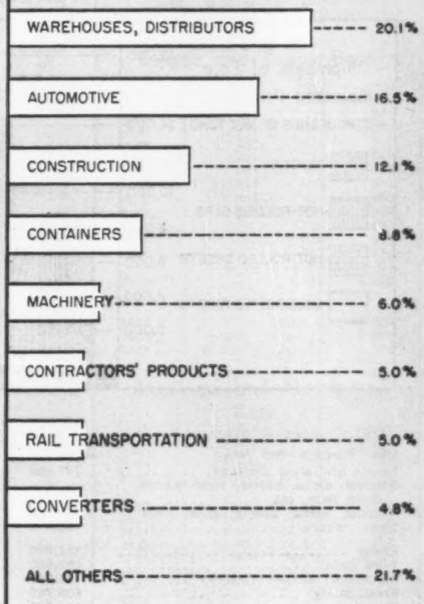
*Estimated by STEEL on basis of actual shipments in first 9 months.
American Iron & Steel Institute.

WHERE THE STEEL GOES

1956 — ESTIMATED



DISTRIBUTION

NET TONS

By Market Classifications	STAINLESS STEEL			ALLOY STEEL (Other than Stainless)			CARBON STEEL		
	9 mos. 1956	12 mos. 1955	12 mos. 1954	9 mos. 1956	12 mos. 1955	12 mos. 1954	9 mos. 1956	12 mos. 1955	12 mos. 1954
Converters and Processors	41,480	61,364	30,002	63.787	86.603	58,537	2,808,000	3,605,414	2,364,164
Forgings (Other than Automotive)	19,344	13,986	8,678	402,110	517,513	340,005	682,453	734,533	482,282
Bolts, Nuts, Rivets, Screws	6,371	9,349	6,480	63.933	82,113	48,472	995,788	1,383,878	909,531
Warehouses and Distributors	159,319	188,311	123,276	438,617	574,614	419,793	11,627,879	14,995,080	11,456,401
Construction, including Maintenance	3,848	4,249	5,059	79,303	79,085	67,260	7,265,358	9,598,444	8,562,668
Contractors' Products	13,181	17,317	9,337	14,035	24,729	13,060	3,023,010	3,940,115	2,947,415
Automotive	70,044	143,016	86,303	1,155,107	2,122,267	1,297,244	8,787,736	16,456,597	10,409,442
Rail Transportation	2,327	5,244	4,688	155,851	156,945	70,566	2,917,042	3,358,660	2,382,043
Shipbuilding, Marine Equip.	1,689	2,259	1,537	49,266	44,762	58,104	471,537	554,213	441,590
Aircraft	24,764	22,379	18,600	53,088	46,300	38,638	20,883	28,213	31,610
Oil and Gas Drilling	885	405	592	172,003	208,938	134,946	411,678	583,424	450,024
Mining, Quarrying, Lumbering	324	415	249	24,219	29,108	13,540	238,813	239,464	187,835
Agricultural	753	464	389	23,617	39,231	27,053	809,235	1,297,191	1,161,757
Machinery, Indus. Equip. & Tools	41,988	41,103	29,051	512,746	597,606	385,274	3,122,189	4,060,315	3,102,713
Electrical Machinery and Equip.	14,190	8,953	7,131	438,040	562,861	407,228	1,338,332	1,720,052	1,324,648
Appliances, Utensils, Cutlery	35,500	48,162	31,914	15,780	21,487	19,342	1,588,322	2,129,465	1,390,205
Other Domestic & Commercial Equip.	11,854	15,259	11,488	22,896	21,793	16,537	1,671,148	2,152,364	1,714,065
Containers	2,125	3,874	1,610	28,366	29,335	17,444	5.294,838	6,689,865	5,851,564
Ordnance, Other Military	2,645	3,035	3,559	60,354	92,191	113,631	313,841	761,301	847,250
Export	15,794	24,761	16,603	155,446	125,064	105,778	2,338,897	3,433,252	2,411,502
Unclassified	26,067	72,544	55,805	141,288	166,973	113,300	533,663	679,637	505,914
Total	494,492	686,449	452,351	4,069,852	5.629,518	3,765,752	56,260,642	78,401,477	58,934,623

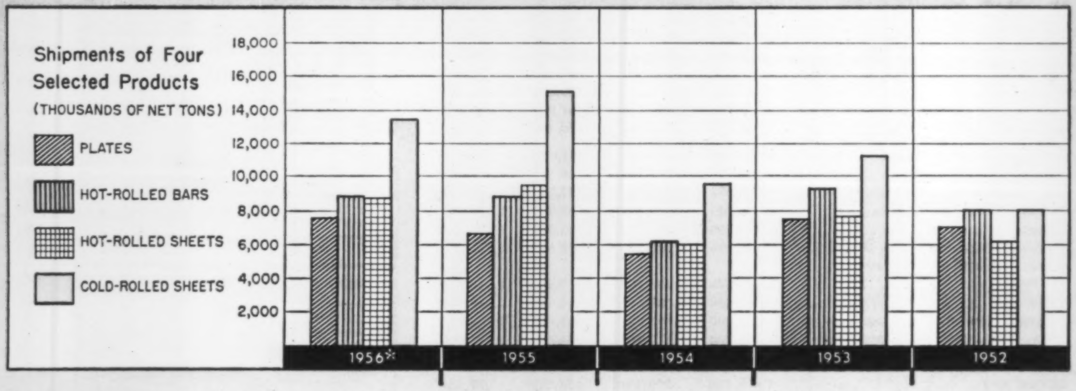
American Iron & Steel Institute.

Steel Shipments

METALWORKING FACTS AND FIGURES

SHIPMENTS OF STEEL PRODUCTS

(All grades, including carbon, alloy and stainless)



Steel Products—Net tons	1956* Shipments	%	1955 Shipments	%	1954 Shipments	%	1953 Shipments	%	1952 Shipments	%
Ingots and steel castings	747,600	0.89	678,630	0.8	316,664	0.5	918,589	1.1	1,128,070	1.7
Blooms, slabs, billets, tube rounds, sheet bars, etc.	....	...	2,744,477	3.2	1,530,025	2.4	2,625,152	3.3	2,301,042	3.4
Blooms, slabs, billets, sheet bars	2,293,200	2.73	....	..	....	..	....	..	....	..
Tube rounds	16,800	0.02	....	..	....	..	....	..	....	..
Skelp	184,800	0.22	191,591	0.2	129,679	0.2	113,397	0.1	107,134	0.2
Wire rods	1,092,000	1.30	1,203,842	1.4	760,885	1.2	800,648	1.0	741,541	1.1
Structural shapes (heavy)	5,191,200	6.18	4,736,987	5.6	4,501,183	7.1	5,022,012	6.3	4,138,251	6.1
Steel piling	403,200	0.48	391,348	0.5	387,654	0.6	342,894	0.4	234,461	0.3
Plates	7,644,000	9.10	6,762,258	8.0	5,340,262	8.5	7,668,274	9.6	7,006,123	10.3
Rails—Standard (over 60 lb)	1,167,600	1.39	1,150,977	1.3	1,113,366	1.8	1,866,546	2.3	1,348,324	2.0
Rails—All other	100,800	0.12	82,767	0.1	83,577	0.1	87,510	0.1	105,704	0.1
Joint bars	92,400	0.11	68,314	0.1	64,304	0.1	121,102	0.2	109,288	0.1
Tie plates	327,600	0.39	311,411	0.4	236,011	0.4	425,945	0.5	377,817	0.6
Track spikes	109,200	0.13	93,097	0.1	65,608	0.1	120,409	0.2	97,634	0.1
Wheels (rolled or forged)	352,800	0.42	306,406	0.4	192,483	0.3	332,245	0.4	329,825	0.5
Axles	168,000	0.20	119,246	0.1	60,956	0.1	154,210	0.2	164,230	0.2
Bars—Hot-rolled (including light shapes)	8,820,000	10.50	8,798,261	10.4	6,255,465	9.9	9,323,429	11.6	8,111,683	11.9
Bars—Reinforcing	2,452,800	2.92	2,164,641	2.6	1,750,957	2.8	1,848,851	2.3	1,813,146	2.7
Bars—Cold-finished	1,814,400	2.16	1,877,961	2.2	1,210,273	1.9	2,194,375	2.7	1,922,205	2.8
Tool steel	134,400	0.16	114,529	0.1	84,143	0.1	116,152	0.1	120,687	0.2
Standard pipe	2,948,400	3.51	2,968,241	3.5	2,320,265	3.7	2,801,820	3.5	2,425,351	3.6
Oil country goods	2,545,200	3.03	2,542,109	3.0	2,291,176	3.6	2,019,345	2.5	1,610,132	2.4
Line pipe	3,301,200	3.93	3,083,736	3.7	2,594,873	4.1	3,507,318	4.4	2,882,061	4.2
Mechanical tubing	991,200	1.18	965,829	1.1	674,214	1.1	1,089,480	1.4	945,314	1.4
Pressure tubing	378,000	0.45	276,068	0.3	277,208	0.4	440,675	0.6	417,550	0.6
Wire—Drawn	3,108,000	3.70	3,192,678	3.8	2,420,982	3.8	2,826,744	3.5	2,638,562	3.9
Wire—Nails and staples	604,800	0.72	650,956	0.7	567,382	0.9	528,935	0.7	651,447	1.0
Wire—Barbed and twisted	92,400	0.11	113,372	0.1	132,346	0.2	163,801	0.2	240,733	0.3
Wire—Woven wire fence	319,200	0.38	312,158	0.4	299,917	0.5	245,264	0.3	331,405	0.5
Wire—Bale ties	58,800	0.07	60,389	0.1	51,749	0.1	37,945	..	57,766	0.1
Black plate	806,400	0.96	797,720	1.0	672,803	1.1	748,889	0.9	879,931	1.3
Tin and terne plate—Hot dipped	991,200	1.18	1,100,762	1.3	1,307,096	2.1	1,318,080	1.6	1,365,590	2.0
Tin plate—Electrolytic	4,947,600	5.89	4,503,637	5.3	3,680,467	5.8	3,343,458	4.2	2,817,449	4.1
Sheets—Hot-rolled	8,727,600	10.39	9,430,711	11.1	6,094,268	9.7	7,742,609	9.7	6,098,899	9.0
Sheets—Cold-rolled	13,524,000	16.10	15,167,629	17.9	9,605,689	15.2	11,274,369	14.1	8,009,255	11.8
Sheets—Galvanized	3,015,600	3.59	2,864,497	3.4	2,362,632	3.7	2,290,868	2.9	1,961,158	2.9
Sheets—All other coated	243,600	0.29	275,046	0.3	178,961	0.3	253,946	0.3	206,332	0.3
Sheets—Enameling	....	...	....	..	180,218	0.3	228,938	0.3	149,108	0.2
Electrical sheets and strip	831,600	0.99	791,043	0.9	588,851	0.9	820,096	1.0	607,076	0.9
Strip—Hot-rolled	1,814,400	2.16	2,089,491	2.5	1,486,141	2.4	2,221,462	2.8	1,837,086	2.7
Strip—Cold-rolled	1,638,000	1.95	1,734,629	2.1	1,281,993	2.0	2,166,111	2.7	1,714,242	2.5
Total steel products	84,000,000	100.00	84,717,444	100.0	63,152,726	100.0	80,151,893	100.0	68,003,612	100.0

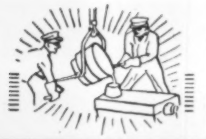
1956 SHIPMENTS OF FINISHED STEEL BY TYPES

(Net tons)

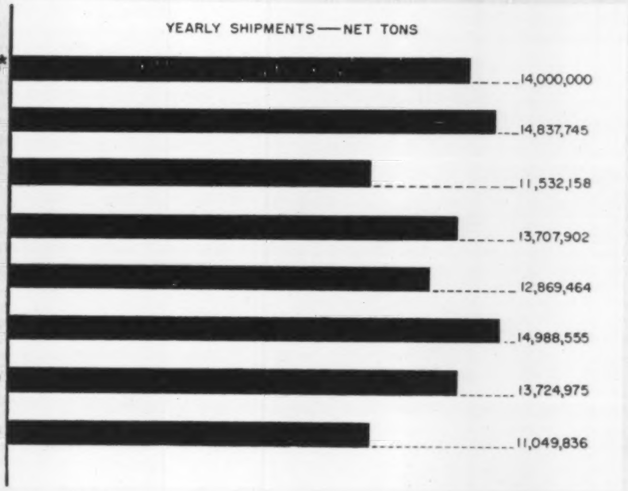
	Carbon	Alloy	Stainless	Total
Jan.	6,970,755	555,969	61,146	7,587,870
Feb.	6,881,078	528,114	59,201	7,468,393
Mar.	7,620,710	576,826	58,288	8,255,824
Apr.	7,206,375	519,368	58,130	7,783,873
May	7,182,815	521,059	60,902	7,764,776
June	7,479,688	530,429	67,688	8,077,805
July	1,172,890	93,305	22,793	1,288,988
Aug.	5,158,778	334,093	47,044	5,539,915
Sept.	6,550,202	448,503	59,323	7,058,028
9 Mos.	56,223,291	4,107,666	494,515	60,825,472

American Iron & Steel Institute.

*Estimated.



GRAY IRON CASTINGS



Shipments—Net Tons

	Miscel-laneous	Ingot Molds	Chilled Iron Railroad Car Wheels	Cast Iron Pressure Pipe & Fittings	Cast Iron Soil Pipe & Fittings	For Sale	For Own Use
1956							
9 Mos.	6,113,634	1,865,978	321,612	1,366,929	645,205	6,019,449	4,293,909
Jan.	769,826	257,150	32,408	131,346	58,788	677,017	572,501
Feb.	739,786	242,207	35,074	133,254	64,448	680,494	534,275
Mar.	752,498	254,045	42,676	132,384	73,802	715,173	540,232
Apr.	719,109	237,486	39,325	151,670	70,410	702,145	515,855
May	702,239	243,719	38,544	171,859	91,400	749,681	498,080
June	656,778	217,135	34,028	170 122	74,093	686,896	465,260
July	509,702	9,556	32,484	144,964	65,905	487,736	274,875
Aug.	639,953	170,857	31,712	180,249	80,424	671,523	431,672
Sept.	623,743	233,823	35,361	151,081	65,935	648,784	461,159
Oct.	......	......	......	......	......	......	......
Nov.	......	......	......	......	......	......	......
Dec.	......	......	......	......	......	......	......
1955	9,161,655	2,739,874	385,041	1,681,630	869,515	7,987,205	6,850,540
Jan.	712,097	192,132	25,783	100,638	61,273	563,153	528,770
Feb.	720,304	196,118	27,401	95,285	67,057	578,171	527,994
Mar.	847,874	217,571	36,732	129,746	82,995	688,733	626,185
Apr.	819,872	216,116	35,415	145,871	76,404	679,867	613,811
May	803,897	227,236	35,966	168,772	74,553	707,105	603,319
June	793 067	228,044	43,807	147,351	83,927	715,862	580,334
July	634,869	210,130	28,181	129,191	67,340	579 122	490,589
Aug.	718,423	238,007	29,298	156,074	84,510	688,317	537,995
Sept.	731,073	244,199	29,953	165 332	82,179	712,688	540,048
Oct.	795,875	245,759	51,877	160,875	75,923	713,671	596,638
Nov.	797,854	262,506	29,795	148,560	66,918	696,523	609,110
Dec.	786,480	262,056	30,833	133,935	46,436	663,993	595,747
1954	7,291,912	1,784,625	336,239	1,375,671	743,711	6,322,989	5,209,169
Jan.	607,755	154,359	31,316	90,898	47,970	488 497	443,801
Feb.	607,085	156,933	29,240	92,546	50,560	491,983	444,381
Mar.	684,272	153,366	34,240	113,016	61,885	553 358	493,421
Apr.	657,126	126,083	29,075	116,420	66,348	528,027	467,025
May	605,385	122,839	27,144	122,514	65,453	516 475	426,860
June	616,317	141,712	30,883	130,503	67,395	556,047	430,763
July	510,173	131,150	22,902	97,810	59,086	449,621	371,530
Aug.	569,790	140,165	29,134	127,255	68,300	541,904	392,740
Sept.	559,934	139,679	25,374	124,821	71,424	533 909	387,323
Oct.	569,985	150,282	23,979	130,326	68,362	552,022	390,912
Nov.	623,390	167,983	25,723	118,480	61,725	547,447	449,854
Dec.	680,700	200,044	27,229	111,082	55,203	563,699	510,559
1953	8,449,837	2,828,159	467,142	1,285,598	677,166	7,494,843	6,213,059
1952	8,122,274	2,238,309	544,896	1,312,518	651,467	7,371,700	5,497,764
1951	9 573,347	2,614,517	639,996	1,473,192	687,503	8,453,048	6,535,507
1950	8,745,298	2,423,376	546,301	1,215,367	794,633	7,323,739	6,401,236
1949	7,004,674	1,844,485	581,690	1,037,189	581,798	5,787,146	5,262,690

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*Estimated.

U.S. Bureau of the Census.

DIE CASTINGS

Shipments—Thousands of Pounds

Copper and Copper-Base

	1956	1955	1954
Jan.	799	589	816
Feb.	727	639	758
Mar.	782	740	875
Apr.	722	651	377
May	751	762	318
June	755	737	456
July	506	688	392
Aug.	904	842	459
Sept.	929	689	548
Oct.	....	724	521
Nov.	....	740	507
Dec.	....	711	482
Total	....	8,512	6,509

YEARLY TOTALS

1953	10,077	1950	15,099
1952	8,259	1949	9,499
1951	12 516	1948	13,642

Aluminum and Aluminum-Base

	1956	1955	1954
Jan.	33,253	26,758	20,826
Feb.	32,949	28,241	19,830
Mar.	33,965	33,355	23,851
Apr.	31,782	30,285	21,578
May	29,814	31 323	19,559
June	25,027	27,929	19,029
July	23,491	21,490	15,038
Aug.	29,553	26,726	15,835
Sept.	31,640	28,786	19,344
Oct.	.....	31,829	22,247
Nov.	.....	33,997	22,137
Dec.	.....	34 484	26,017
Total	.....	355,203	245,291

YEARLY TOTALS

1953	239,330	1950	167,201
1952	169,732	1949	98,340
1951	151,465	1948	128,903

Zinc and Zinc-Base

	1956	1955	1954
Jan.	67,346	57,519	42,886
Feb.	65,848	57,525	40,244
Mar.	68,082	70,858	49 501
Apr.	60,632	70,692	42,793
May	51,039	62,684	40,419
June	47,330	65,663	43,923
July	41,762	46,822	31,309
Aug.	51,812	61,702	37 599
Sept.	45,845	61,114	38,482
Oct.	.....	70,815	41,652
Nov.	.....	74,187	51,339
Dec.	.....	69,899	53,798
Total	.....	769,480	513,945

YEARLY TOTALS

1953	515,033	1950	574,196
1952	405,538	1949	397 001
1951	474,937	1948	457,088

Lead and Lead-Base

	1956	1955	1954
Jan.	1,598	1,742	1,514
Feb.	1,636	1,577	1,303
Mar.	1,644	1,541	1,335
Apr.	1,910	1,618	1,559
May	1,919	1,536	1,529
June	1 833	2,052	1,711
July	1,551	1,689	1,391
Aug.	2,112	1,911	1,726
Sept.	1,539	1,931	1,626
Oct.	....	1,795	1,784
Nov.	....	1,903	1,355
Dec.	....	1,822	1,563
Total	....	21,117	18,396

YEARLY TOTALS

1953	20,444	1950	20,977
1952	20,941	1949	13,743
1951	25,936	1948	22,887

U.S. Bureau of the Census.

Castings

METALWORKING FACTS AND FIGURES

STEEL CASTINGS

Shipments—Net Tons

	Carbon	Alloy, Including Stainless	For Sale	For Own Use	Total
1956					
9 Mos. ..	1,069,980	363,538	1,124,023	309,495	1,433,518
Jan.	116,092	42,526	123,343	35,275	158,618
Feb.	123,279	42,119	128,598	36,800	165,398
Mar.	126,583	43,462	130,839	39,206	170,045
Apr.	121,723	41,985	125,015	38,693	163,708
May	134,919	43,308	142,025	36,202	178,227
June	122,483	42,178	129,147	35,514	164,661
July	88,971	29,013	96,350	21,634	117,984
Aug.	119,025	40,806	127,001	32,830	159,831
Sept.	116,905	38,141	121,705	33,341	155,046
Oct.	......	.....	......	.....	......
Nov.	......	.....	......	.....	......
Dec.	......	.....	......	.....	......
1955	1,088,489	442,206	1,166,706	363,988	1,530,694
Jan.	67,397	30,841	75,044	23,194	98,238
Feb.	74,709	31,721	80,729	25,701	106,430
Mar.	88,867	38,593	98,926	28,534	127,460
Apr.	84,247	35,806	92,237	27,816	120,053
May	85,950	36,515	92,713	29,752	122,465
June	93,417	40,470	102,457	31,430	133,887
July	68,094	29,781	71,170	26,705	97,875
Aug.	91,245	35,161	96,290	30,116	126,406
Sept.	100,775	40,068	107,622	33,221	140,843
Oct.	105,345	40,329	110,409	35,265	145,674
Nov.	111,571	40,810	116,908	35,473	152,381
Dec.	116,872	42,110	122,201	36,781	158,982
1954	802,811	381,285	880,158	303,938	1,184,096
Jan.	83,927	38,831	93,577	29,181	122,758
Feb.	81,433	35,087	88,699	27,821	116,520
Mar.	85,211	37,099	92,271	30,039	122,310
Apr.	72,118	33,670	78,754	27,034	105,788
May	64,546	30,064	70,596	24,014	94,610
June	69,021	31,001	72,881	27,141	100,022
July	50,453	25,395	53,207	22,641	75,848
Aug.	61,334	28,256	66,792	22,798	89,590
Sept.	59,039	29,320	64,722	23,637	88,359
Oct.	56,705	30,380	64,004	23,081	87,085
Nov.	56,057	31,602	64,812	22,847	87,659
Dec.	62,967	30,580	69,843	23,704	93,547
1953	1,276,729	557,468	1,400,013	434,184	1,834,197
1952	1,375,233	552,709	1,476,242	451,700	1,927,942
1951	1,541,480	508,574	1,506,903	543,151	2,050,054
1950	1,129,588	350,999	1,081,650	398,937	1,480,587
1949	962,601	297,369	n.a.	n.a.	1,259,970

U.S. Bureau of the Census. n.a.=not available.

MALLEABLE IRON CASTINGS

Shipments—Net Tons

	For Sale	For Own Use	Total
1956			
9 Mos. ..	415.170	296.101	711,271
Jan.	54,618	38,944	93.562
Feb.	54,466	39.067	93,533
Mar.	46,266	40.675	86,941
Apr.	47,064	36,256	83.320
May	51,053	29.085	80,138
June	45,022	30.613	75.635
July	31.300	23.040	54,340
Aug.	43.479	30,943	74,422
Sept.	41,902	27.478	69,380
Oct.	.....	.....	.....
Nov.	.....	.....	.....
Dec.	.....	.....	.....
1955	1,652.552	452.223	1,104.775
Jan.	48,000	34.028	82.028
Feb.	48,721	37.258	85.979
Mar.	60.063	42.301	102,364
Apr.	57.397	43,829	101.226
May	57,317	41,080	98,397
June	60.261	39,195	99,456
July	44,914	30.656	75,570
Aug.	48,126	34,322	82,448
Sept.	55,471	31,744	87.215
Oct.	53.804	37.062	90,866
Nov.	58,069	41.211	99.280
Dec.	60,409	39,537	99.946
1954	461,925	360.091	822,016
Jan.	38,209	32.079	70.288
Feb.	37.792	31,286	69.078
Mar.	47,125	37,217	84,342
Apr.	39,102	35.413	74,515
May	37.306	30.550	67,856
June	41,121	31.699	72,820
July	25.243	25.650	50.893
Aug.	34.528	24.731	59.259
Sept.	33.929	24.086	58,015
Oct.	36.956	27.365	64.321
Nov.	41.609	28.421	70,030
Dec.	49,005	31.594	80,599
1953	578,749	391,757	970.506
1952	573.472	352.648	926,120
1951	656.076	429,165	1,085,241
1950	536,945	405.279	942,224
1949	373.313	349.585	722,898
1948	527,192	413.992	941,184
1947	514,195	384.605	898,800
1946	452,355	299.673	752,028
1945	520,887	269.844	790,731
1944	619,588	258,645	878,233
1943	653,884	190.755	844,639
1942	590,804	155,204	746,008
1941	619,365	212,808	832,173
1940	400,818	155,391	556,209

U.S. Bureau of the Census.

HIGH ALLOY CASTINGS

Estimated Production by All United States Producers—Pounds

	Heat Resistant	Corrosion Resistant	Abrasion Resistant	Totals
1956	36,480,000*	35,212,000*	11,000,000*	82,692,000*
1st Qtr. ..	8,833,000†	8,244,000†	2,440,000†	19,517,000†
2nd Qtr. ..	9,336,000†	9,415,000†	3,200,000†	21,951,000†
3rd Qtr. ..	8,711,000†	8,553,000†	2,660,000†	19,924,000†
4th Qtr. ..	9,600,000*	9,000,000*	2,700,000*	21,300,000*
1955	30,499,600	25,741,600	10,214,100	66,455,300
1st Qtr. ..	6,900,800	6,630,700	2,225,500	15,757,000
2nd Qtr. ..	7,861,100	6,479,300	3,025,500	17,365,900
3rd Qtr. ..	7,240,200	5,594,400	2,438,800	15,273,400
4th Qtr. ..	8,497,500	7,037,200	2,524,300	18,059,000

	Heat Resistant	Corrosion Resistant	Abrasion Resistant	Totals
1954	29,108,300	24,316,300	8,426,600	61,851,200
1953	39,311,600	29,151,600	8,706,900	77,170,100
1952	40,807,600	26,197,800	7,827,500	74,832,900
1951	38,277,000	28,771,600	6,132,300	73,180,900
1950	26,894,000	19,033,200	3,321,200	49,248,400
1949	19,791,700	12,997,100	1,500,700	34,289,500
1948	24,030,400	16,285,200	2,525,300	42,840,900
1947	21,505,100	16,346,900	1,534,500	39,386,500
1946	20,398,800	15,150,400	1,860,700	37,409,900
1945	23,002,700	12,276,200	1,482,000	36,760,900
1944	27,698,800	9,662,100	1,365,700	38,726,600

*Estimated. †Preliminary.
Alloy Casting Institute.

NONFERROUS CASTINGS

Zinc and Zinc-Base Alloy Castings

Shipments—Thousands of Pounds

	Die	All Other	Total
1956			
9 Mos.	494,396	5,140	499,536
Jan.	67,346	704	68,050
Feb.	65,848	736	66,584
Mar.	65,082	678	65,760
Apr.	57,632	642	58,274
May	51,739	466	52,205
June	47,330	445	47,775
July	41,762	465	42,227
Aug.	51,812	509	52,321
Sept.	45,845	495	46,340
Oct.	.....	...	.....
Nov.	.....	...	.....
Dec.	.....	...	.....
1955	769,480	8,520	778,000
Jan.	57,519	671	58,190
Feb.	57,525	672	58,197
Mar.	70,858	738	71,596
Apr.	70,692	719	71,411
May	62,684	710	63,394
June	65,663	666	66,329
July	46,822	539	47,361
Aug.	61,702	720	62,422
Sept.	61,114	690	61,804
Oct.	70,815	714	71,529
Nov.	74,187	773	74,960
Dec.	69,899	908	70,807
1954	513,902	6.556	520,458
Jan.	42,880	645	43,525
Feb.	40,238	540	40,778
Mar.	49,494	687	50,181
Apr.	42,787	496	43,283
May	40,413	497	40,910
June	43,917	492	44,409
July	31,309	401	31,710
Aug.	37,599	494	38,093
Sept.	38,481	491	38,972
Oct.	41,651	550	42,201
Nov.	51,338	651	51,989
Dec.	53,795	612	54,407
1953	515,033	6,220	521,253
1952	405,538	2,815	408,353

U.S. Bureau of the Census.

Magnesium and Magnesium-Base Alloy Castings

Shipments—Thousands of Pounds

	1956	1955	1954	1953	1952
Jan.	2,959	2,307	2,451	3,112	3,238
Feb.	2,977	2,158	2,209	3,274	3,057
Mar.	3,046	2,576	2,425	3,403	3,040
Apr.	3,140	2,621	2,089	3,332	2,793
May	3,021	2,397	1,762	2,705	2,734
June	2,949	2,366	2,062	3,063	2,703
July	2,810	1,913	1,954	2,287	2,405
Aug.	3,059	2,172	2,190	2,490	2,478
Sept.	3.079	2,468	2,095	2,455	3,090
Oct.	....	2,299	2,092	3,024	3,250
Nov.	....	2,324	2,161	2,681	2,959
Dec.	....	2,253	2,287	2,691	3,110
Total	....	27,854	25,777	34,517	34,857

YEARLY SHIPMENTS

1951.......	30,825	1949.......	11,053
1950.......	15,224	1948.......	9,359

U.S. Bureau of the Census.

Copper and Copper-Base Alloy Castings

Shipments—Thousands of Pounds

	Sand	Permanent Mold	Die	Other	Total
1956					
9 Mos.	670,395	45,535	6,875	24,195	747,000
Jan.	80,116	6,135	799	2,717	89,767
Feb.	82,244	5,888	727	2,847	91,706
Mar.	85,894	6,299	782	3,110	96,085
Apr.	81,333	5,835	722	2,789	90,679
May	80,155	5,398	751	2,884	89,188
June	70,260	5,052	755	2,854	78,921
July	55,027	3,193	506	2,200	60,926
Aug.	70,479	3,805	904	2,431	77,619
Sept.	64,887	3,930	929	2,363	72,109
Oct.	.....	....	....	....	.....
Nov.	.....	....	....	....	.....
Dec.	.....	....	....	....	.....
1955	905,867	63,111	8,512	31,408	1,008,898
Jan.	64,249	4,676	589	2,424	71,938
Feb.	67,354	4,599	639	2,246	74,838
Mar.	83,088	5,659	740	2,609	92,096
Apr.	75,424	5,161	651	2,474	83,710
May	75,636	5,525	762	2,667	84,590
June	80,462	5,851	737	3,028	90,078
July	58,947	4,000	688	1,989	65,624
Aug.	78,508	5,331	842	2,413	87,094
Sept.	80,346	5,611	689	2,824	89,470
Oct.	82,836	4,517	724	2,994	91,071
Nov.	80,813	5,808	740	2,861	90,222
Dec.	78,204	6,373	711	2,879	88,167
1954	751,917	48,848	6,509	27,394	834,668
1953	888,369	61,316	10,077	30,734	990,496
1952	910,862	63,865	8,259	26,924	1,009,910
1951	1,075,437	69,883	12,516	39,607	1,197,443
1950	953,590	55,614	15,099	32,670	1,056,973
1949	671,080	38,767	9,499	24,475	743,821
1948	947,044	60,552	13,642	29,217	1,050,455

U.S. Bureau of the Census.

Aluminum and Aluminum-Base Alloy Castings

Shipments—Thousands of Pounds

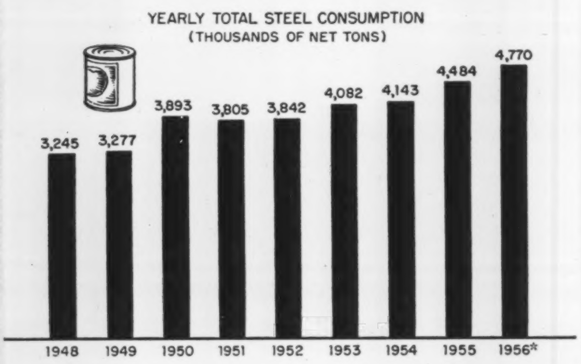
	Sand	Permanent Mold	Die	Other	Total
1956					
9 Mos.	129,650	183,071	271,474	5,558	589,753
Jan.	15,861	24,528	33,253	510	74,152
Feb.	15,560	23,963	32,949	624	73,096
Mar.	16,597	22,816	33,965	407	73,785
Apr.	14,732	20,718	31,782	648	67,880
May	15,600	19,669	29,814	703	65,786
June	13,448	19,067	25,027	647	58,189
July	12,398	16,388	23,491	678	52,955
Aug.	13,100	18,067	29,553	687	61,407
Sept.	12,354	17,855	31,640	654	62,503
Oct.	.....	.....	.....	.....	.....
Nov.	.....	.....	.....	.....	.....
Dec.	.....	.....	.....	.....	.....
1955	165,482	298,349	355,203	8,128	827,162
Jan.	12,863	23,694	26,758	558	63,873
Feb.	13,169	24,334	28,241	737	66,481
Mar.	15,624	29,048	33,355	682	78,709
Apr.	13,863	28,095	30,285	618	72,861
May	13,741	25,614	31,323	616	71,294
June	14,369	24,697	27,929	932	67,927
July	11,081	21,017	21,490	655	54,243
Aug.	14,423	22,280	26,726	576	64,005
Sept.	14,162	23,090	28,786	693	66,731
Oct.	13,852	25,150	31,829	836	71,667
Nov.	13,650	26,284	33,997	619	74,550
Dec.	14,655	25,046	34,484	606	74,791
1954	156,555	214,407	245,291	6,801	623,054
1953	214,553	200,025	239,330	4,114	658,022
1952	194,616	146,883	169,732	7,748	518,979
1951	193,378	160,011	151,465	10,277	515,131
1950	184,782	181,366	167,201	9,733	543,082
1949	122,604	123,523	98,340	7,311	351,778
1948	153,845	183,627	128,903	5,242	471,617

U.S. Bureau of the Census.

Containers & Closures

METAL CANS

Shipments in Terms of Net Tons of Steel Consumed



	Food Cans	Nonfood Cans	Total	For Sale
1956				
10 Mos.	2,699,554	1,539,041	4,238,595	3,669,209
Jan.	171,924	118,108	290,032	243,657
Feb.	175,092	120,878	295,970	250,723
Mar.	193,360	145,176	338,536	288,099
Apr.	321,524	158,777	480,301	422,924
May	182,338	153,200	335,538	278,287
June	224,296	180,786	405,082	345,429
July	266,366	182,193	448,559	396,181
Aug.	419,818	174,953	594,771	531,895
Sept.	392,161	141,103	533,264	458,042
Oct.	352,675	163,867	516,542	453,972
Nov.	......	......	......	......
Dec.	......	......	......	......
1955	2,801,601	1,682,398	4,483,999	3,909,855
Jan.	170,869	108,682	279,551	239,950
Feb.	155,503	105,011	260,514	223,927
Mar.	172,794	136,326	309,120	265,456
Apr.	183,251	142,840	326,091	273,505
May	223,587	157,043	380,630	329,880
June	230,803	167,854	398,657	347,362
July	266,735	161,371	428,106	385,917
Aug.	391,817	173,285	565,102	511,667
Sept.	355,685	155,703	511,388	443,322
Oct.	343,742	157,689	501,431	445,325
Nov.	150,276	102,382	252,658	212,913
Dec.	156,539	114,212	270,751	230,631
1954	2,605,124	1,538,205	4,143,329	3,657,604
Jan.	161,450	103,301	264,751	224,623
Feb.	158,093	102,106	260,199	225,743
Mar.	164,625	126,767	291,392	252,080
Apr.	188,262	135,777	324,039	278,428
May	180,705	136,961	317,666	276,313
June	224,254	156,922	381,176	339,473
July	249,376	155,776	405,152	368,035
Aug.	376,530	145,763	522,293	477,256
Sept.	328,454	129,529	457,983	408,415
Oct.	236,275	125,401	361,676	319,669
Nov.	166,975	106,641	273,616	239,881
Dec.	170,125	113,261	283,386	247,688
1953	2,614,764	1,467,490	4,082,254	3,571,489
1952	2,554,874	1,287,296	3,842,170	3,340,899
1951	2,558,591	1,245,960	3,804,551	3,309,592
1950	2,550,949	1,342,435	3,893,384	3,423,602
1949	2,261,432	1,015,493	3,276,925	2,845,709
1948	2,317,487	927,658	3,245,145	2,771,104

U.S. Bureau of the Census.

*Estimated.

Commercial Closures

Shipments—In Thousands of Units

	Metal Caps	Plastic Caps†
1956		
9 Mos.	10,524,604	2,287,866
Jan.	954,906	257,366
Feb.	1,055,890	256,010
Mar.	1,073,714	275,221
Apr.	1,110,985	243,675
May	1,203,366	247,725
June	1,234,415	253,790
July	1,362,352	242,529
Aug.	1,416,915	252,770
Sept.	1,112,061	258,780
Oct.	....	....
Nov.	....	....
Dec.	....	....
1955	14,135,632	2,850,363
Jan.	1,067,225	212,156
Feb.	1,075,984	205,849
Mar.	1,115,598	255,245
Apr.	1,020,563	231,978
May	1,140,748	228,118
June	1,281,841	234,915
July	1,110,220	204,375
Aug.	1,417,438	262,741
Sept.	1,174,541	256,787
Oct.	1,220,149	283,085
Nov.	1,128,884	232,769
Dec.	1,382,441	242,345
1954	12,705,438	2,543,837
1953	11,854,403	2,609,220
1952	10,920,941	2,166,856
1951	11,038,609	2,760,724

†Not including caps for collapsible tubes.
U.S. Bureau of the Census.

Tin Mill Products Consumed in Producing Closures

Consumption in Terms of Base Boxes

	Commercial Metal Caps	Crowns	Home Canning Closures†
1956			
9 Mos.	2,230,734	2,366,399	557,635
Jan.	225,428	275,127	51,755
Feb.	246,580	287,066	57,901
Mar.	276,748	334,460	67,914
Apr.	268,192	369,544	65,359
May	197,702	237,612	77,867
June	243,117	201,444	79,012
July	264,280	242,397	44,087
Aug.	275,716	234,059	69,711
Sept.	232,971	184,690	44,029
Oct.	......	......	.....
Nov.	......	......	.....
Dec.	......	......	.....
1955	2,910,576	3,179,904	671,788
Jan.	224,024	230,784	50,288
Feb.	219,334	222,001	52,840
Mar.	260,796	240,445	70,575
Apr.	239,488	271,233	65,715
May	243,410	305,488	65,907
June	256,663	305,291	72,390
July	240,266	292,165	48,908
Aug.	271,958	294,979	80,336
Sept.	245,002	256,132	27,901
Oct.	250,065	258,689	48,281
Nov.	237,021	264,261	46,681
Dec.	222,549	238,436	41,966
1954	2,629,231	3,014,165	658,935
1953	2,461,563	3,158,560	685,042

†Includes milk bottle closures.
U.S. Bureau of the Census.

Crowns

Shipments—In Gross

	1956	1955	1954
Jan.	29,405,053	21,333,428	21,412,694
Feb.	29,328,414	19,961,660	32,118,979
Mar.	34,369,266	26,958,811	30,977,223
Apr.	37,619,290	28,545,237	27,096,400
May	23,861,875	30,426,531	24,038,085
June	20,566,426	32,963,261	30,543,664
July	24,548,106	32,927,590	31,191,929
Aug.	25,999,603	33,045,760	28,514,461
Sept.	20,757,026	27,363,808	24,518,291
Oct.	....	24,803,654	21,437,339
Nov.	....	22,053,579	20,417,819
Dec.	....	26,349,693	21,474,381
Totals	....	326,733,012	313,741,265

YEARLY TOTALS

1953....	315,956,453	1952....	352,416,643

U.S. Bureau of the Census.

Aluminum Consumed in Producing Closures

Pounds

	Commercial Closures	Milk Bottle Closures	Foil Liners	Total
1956				
9 Mos.	8,324,059	4,787,325	1,712,248	14,823,632
Jan.	722,868	545,622	199,216	1,467,706
Feb.	728,938	526,209	200,825	1,455,972
Mar.	896,050	571,766	214,231	1,682,047
Apr.	971,999	495,014	207,736	1,674,749
May	918,950	527,176	164,923	1,611,049
June	1,192,327	461,585	161,876	1,815,788
July	1,017,142	589,098	215,150	1,821,390
Aug.	964,233	572,181	203,329	1,739,743
Sept.	911,552	498,674	144,962	1,555,188
1955	10,010,859	6,053,485	2,348,924	18,413,268
Jan.	623,797	437,399	164,111	1,225,307
Feb.	644,472	487,511	163,782	1,295,765
Mar.	842,672	605,666	197,166	1,645,504
Apr.	874,140	504,805	223,699	1,602,644
May	876,680	463,813	245,205	1,585,698
June	1,001,154	503,546	271,971	1,776,671
July	961,112	413,954	227,541	1,602,607
Aug.	1,084,028	535,283	228,742	1,848,053
Sept.	926,582	559,314	184,074	1,669,970
Oct.	769,157	553,759	153,685	1,476,601
Nov.	690,192	494,664	151,679	1,336,535
Dec.	716,873	493,771	137,269	1,347,913
1954	9,072,888	4,846,299	2,423,771	16,342,958

Heavy Steel Barrels and Drums

Shipments for Sale—Number of Units

	1956	1955	1954
Jan.	1,940,081	1,742,274	1,599,615
Feb.	1,982,997	1,746,912	1,680,540
Mar.	2,259,692	2,124,565	1,950,222
Apr.	2,294,404	1,989,904	1,892,472
May	2,468,812	2,062,366	1,908,422
June	2,659,143	2,513,715	2,038,009
July	2,378,715	2,077,593	1,848,190
Aug.	2,035,491	2,230,442	1,784,802
Sept.	1,730,954	2,032,407	1,901,506
Oct.	....	2,075,022	1,868,475
Nov.	....	2,042,455	1,781,680
Dec.	....	2,184,688	1,796,826

YEARLY TOTALS

1955	24,822,343	1951	29,762,990
1954	22,050,759	1950	26,240,548
1953	23,558,440	1949	23,109,638
1952	24,028,291	1948	27,069,717

Light Steel Barrels and Drums

Shipments for Sale—Number of Units

	1956	1955	1954
Jan.	786,867	685,788	564,291
Feb.	765,166	677,844	587,896
Mar.	775,825	770,232	632,184
Apr.	821,589	774,951	662,055
May	926,424	851,667	642,451
June	893,601	888,666	744,421
July	851,086	790,278	669,119
Aug.	812,750	843,978	579,225
Sept.	755,229	829,042	611,782
Oct.	......	743,466	675,116
Nov.	......	770,963	689,264
Dec.	......	785,179	679,805

YEARLY TOTALS

1955	9,412,054	1951	8,290,340
1954	7,737,199	1950	7,816,535
1953	7,740,669	1949	6,079,913
1952	7,602,519	1948	7,346,312

Steel Shipping Packages, Kegs and Pails

Shipments for Sale—Number of Units

	1956	1955	1954
Jan.	5,788,072	5,036,886	5,324,534
Feb.	5,924,450	4,859,792	5,084,205
Mar.	6,557,724	6,147,901	5,842,678
Apr.	7,013,345	6,441,670	5,994,364
May	7,407,559	6,779,107	5,552,442
June	7,845,745	7,399,292	6,118,740
July	7,365,417	6,625,379	6,018,663
Aug.	7,423,858	7,254,761	5,838,528
Sept.	6,198,244	6,470,152	5,782,122
Oct.	....	6,594,560	5,597,724
Nov.	....	5,840,747	4,951,381
Dec.	....	5,451,096	4,956,950

YEARLY TOTALS

1955	74,901,343	1952	61,285,782
1954	67,062,331	1951	73,681,180
1953	67,007,926	1950	66,128,702

U.S. Bureau of the Census.

STEEL & IRON REQUIRED FOR MODERN-DAY PRODUCTS

Figures show pounds required to make item or required for installation except where finished weight is specified. The weights are not intended to be typical or average. Rather, they are for particular models or types.

PRODUCT	Date estimate was published	IRON AND STEEL (pounds)
Bus (50 seats)	Dec. 1951	12,918
Desk (60 x 30 x 29 in.), finished weight	Dec. 1952	245.81
Freight Cars:	June 1949	
Box Car (40 ft 6 in.), 50-ton capacity		41,540
Covered Hopper, 70-ton capacity		52,940
Flat, 50-ton capacity		47,660
Hopper, 50-ton capacity		41,920
Ore, 70-ton capacity		42,300
Refrigerator, 40-ton capacity		43,940
Grain Combine	June 1950	6,829.77
Hay Baler (10 tons per hour capacity)	Oct. 1951	3,716.58
Lathe, Turret (standard size)	Apr. 1947	8,056
Locomotive, Diesel-Electric, 1500 hp	Apr. 1949	200,700
Motor, Electric (finished weight), ¼ hp	June 1952	18.76
Motor, Electric (finished weight), 5000 hp	June 1952	178,000
Printing Press (4-color, sheet fed gravure)	Oct. 1950	110,900
Railroad Freight Car Truck	Oct. 1949	6,868
Railroad Passenger Car Truck	Oct. 1949	18,460
Railroad Sleeping Car (21-roomette)	June 1951	115,662
Ship, "Independence"	Aug. 1951	37,090,000
		STEEL‡
Automobile (1952 model 4-door sedan)	Oct. 1953	3,542
Bicycle (man's 26-inch deluxe)	Oct. 1952	63.81
Lawn Mower (hand operated)	June 1947	27.60
Tractor, Farm (Wheel type)	Dec. 1946	1,542.82

Containers, by types (finished weights): ....Feb. 1948

Baby Food	1.888 oz	Lard (3-pound)	8.288 oz
Condensed Milk	2.48 oz	Meat (Square, 12-ounce)	2.848 oz
Fish (Sardine, No. 1 flat)	2.5 oz	Olive Oil (Square, 1-quart)	4.96 oz
Fish (Tuna, No. 1)	3.168 oz	Paint (1-gallon)	15.968 oz
Fruit (No. 3)	5.344 oz	Soup (No. 2)	3.808 oz
Fruit Juice (No. 10)	11.08 oz	Vegetable (No. 5)	5.92 oz
Grease (1-pound)	3.776 oz		

House, Six-Room§ (finished weights): ....Oct. 1949

Bathroom	300	Lath	1,800
Conduit	140	Laundry (see below)	...
Doors, Steel	160	Nails and Wire	600
Flashing and Miscellaneous Sheets	200	Pipe	1,200
Frames and Sills	480	Radiator Grills	75
Gutters and Downspouts	475	Screen	32
Hardware	90	Structural Shapes and Columns	680
Heating Equipment	640	Windows	800
Kitchen (see below)	...		

Kitchen—Laundry Combination† (finished weights): ......Apr. 1953

Clothes Dryer	216	Refrigerator	229
Clothes Washer	216	Sink Bowl (double)	22
Dish Washer with Cabinet	150	Stainless Trim for Counter Edge	2
Electrical Raceway System	63	Steel Stool	15
Freezer	283	Stove	254
Garbage Disposal Unit	15	Toaster	7
Ironer	186	Utensils and Cutlery	50
Kitchen Cabinets	887	Venetian Blinds (2)	14
Metal Table with Porcelain Enamel Top	35	Ventilator for Stove	7
Mixer	8		

Tools, Garden: ....June 1955

Fifteen-tooth Bow Rake	2.91	Hedge Shears	3.10
Four-pound Single Bit Ax	6.09	Medium-weight Spading Fork	2.62
Four-tooth Garden Cultivator	0.74	Pruning Shears	1.12
Garden Hoe	1.21	Short-handled Grass Hook	0.84
Garden Spade	4.83	Turf Edger	1.77
Garden Trowel	0.90	Weed Scythe Blade	2.54
Grass and Weed Cutter	1.87		

Tools, Hand. ....Feb. 1953

Ball Peen Hammer	1.64	Mechanic's Double End Wrench	0.442
Chisel	6.8 oz	Pick	6.36
Combination Pliers	10.8 oz	Sledge	10.6
Crow Bar	19.08	Solid Punch	2.18 oz
Drift Pin	1.1	Standard Screw Driver	0.27
Four-Way Wrench	2.33	Timber Felling Wedge	5.3
Mattock	5.3	Wrench	2.75
Maul	10.6		

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‡Iron, if any, not determined. In pounds unless otherwise indicated.

§Not all the uses listed are necessarily found together in the same house, although they may be. The list indicates where steel has been found advantageous.

†List does not give all possible uses of steel in a kitchen, and is intended only to indicate the many functions of steel in a modern kitchen.

American Iron & Steel Institute.

Prices

METALWORKING FACTS AND FIGURES

1956 WEEKLY INDEX OF FINISHED STEEL PRICES

U.S. Bureau of Labor Statistics—1947-1949=100

Week Ended	Index	Week Ended	Index	Week Ended	Index	Week Ended	Index
Jan. 3	155.6	Apr. 3	157.1	July 3	158.2	Oct. 2	168.6
Jan. 10	155.7	Apr. 10	157.1	July 10	158.3	Oct. 9	168.6
Jan. 17	155.8	Apr. 17	157.1	July 17	158.6	Oct. 16	168.6
Jan. 24	155.8	Apr. 24	157.1	July 24	158.6	Oct. 23	168.6
Jan. 31	157.0	Apr. Av.	157.1	July 31	158.6	Oct. 30	168.6
Jan. Av.	155.8			July Av.	158.6	Oct. Av.	168.6
		May 1	158.0				
Feb. 7	157.1	May 8	158.0	Aug. 7	166.1	Nov. 6	168.8
Feb. 14	157.1	May 15	158.1	Aug. 14	168.6	Nov. 13	168.8
Feb. 21	157.1	May 22	158.1	Aug. 21	168.6	Nov. 20	168.8
Feb. 28	157.1	May 29	158.2	Aug. 28	168.6	Nov. 27	168.8
Feb. Av.	157.1	May Av.	158.1	Aug. Av.	168.6	Nov. Av.	168.8
Mar. 6	157.1	June 5	158.2	Sept. 4	168.6	Dec. 4	168.8
Mar. 13	157.1	June 12	158.2	Sept. 11	168.6	Dec. 11	....
Mar. 20	157.1	June 19	158.2	Sept. 18	168.6	Dec. 18	....
Mar. 27	157.1	June 26	158.2	Sept. 25	168.6	Dec. 25	....
Mar. Av.	157.1	June Av.	158.2	Sept. Av.	168.6	Dec. Av.	....

Beehive Metallurgical Coke

Average Price—Net Ton

	1956	1955	1954	1953
Connellsville, furnace	$14.35	$13.70	$14.50	$14.75
Connellsville, foundry	16.97	16.65	16.75	16.82

Oven Foundry Coke

Average Price—Net Ton

Ovens	1956	1955	1954	1953
Kearny, N. J.	$27.54	$24.77	$24.00	$24.00
Milwaukee	28.33	25.69	25.25	25.25

Lake Superior Iron Ore

(Per gross ton; 51½% iron)

	1956	1955	1954	1953
Bessemer Old Range	$11.25	$10.40	$10.30	$10.04
Bessemer Mesabi	11.00	10.25	10.05	9.79
Nonbessemer Old Range	11.10	10.25	10.15	9.89
Nonbessemer Mesabi	10.85	10.10	9.90	9.64
High Phosphorus	10.85	10.00	9.90	9.64

FINISHED STEEL—WEIGHTED PRICE COMPOSITE

(Based on average shipments and prices of the following products during 5-year base period 1935-1939: Structural shapes, plates, rails, hot-rolled and cold-finished bars, pipe, wire, nails, tin plate, hot and cold-rolled sheets, galvanized sheets, hot and cold-rolled strip)

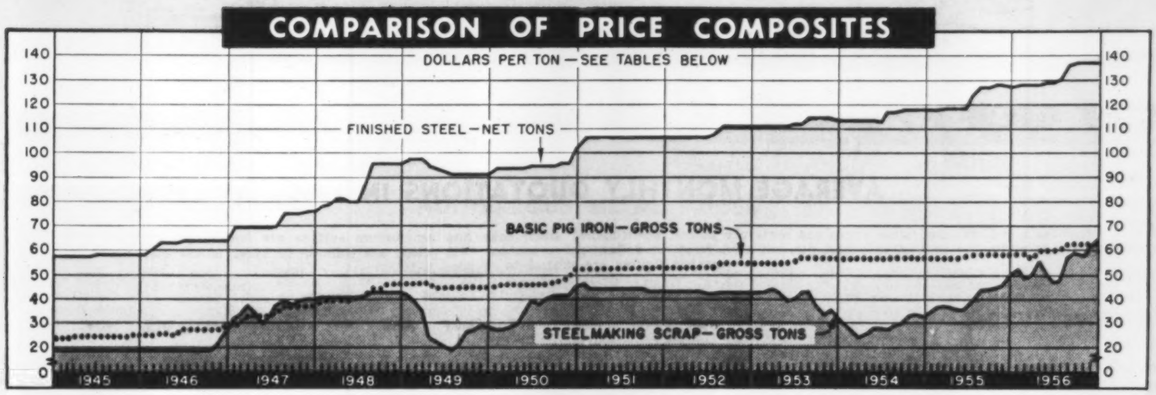
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Avg.
1956..	209.10	209.10	209.10	209.10	210.45	210.45	210.45	221.90	225.71	225.58	225.92	225.92	216.06
1955..	194.53	194.53	194.53	194.53	194.53	194.53	207.59	207.56	207.56	208.90	208.90	208.90	201.38
1954..	139.74	189.74	189.74	189.74	189.74	189.75	194.19	194.19	194.19	194.53	194.53	194.53	192.05
1953..	181.31	181.31	181.31	181.31	182.24	186.06	189.35	189.38	189.80	189.91	189.91	189.74	185.97
1952..	171.92	171.92	171.92	171.92	171.92	171.92	173.83	181.31	181.31	181.31	181.31	181.31	175.99
1951..	171.92	171.92	171.92	171.92	171.92	171.92	171.92	171.92	171.92	171.92	171.92	171.92	171.92
1950..	156.13	156.13	156.13	156.13	156.13	156.54	156.69	156.95	156.99	157.53	157.76	167.87	157.57
1949..	155.05	155.05	154.85	154.01	152.90	152.90	152.80	152.52	152.52	152.52	152.52	154.75	153.53
1948..	132.93	134.56	135.91	135.91	135.02	134.56	143.08	151.99	151.86	151.86	151.86	151.86	142.62
1947..	117.90	118.67	118.67	118.67	118.67	118.67	120.39	128.96	128.96	128.96	129.28	129.28	123.09
1946..	101.87	106.52	111.62	111.62	111.62	111.86	112.04	112.04	112.04	112.04	112.04	112.82	110.70
1945..	100.32	100.65	100.65	100.65	101.10	101.78	101.78	101.85	101.87	101.87	101.87	101.87	101.36
1944..	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16
1943..	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16
1942..	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16
1941..	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16
1940..	99.16	99.16	99.16	97.75	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.16	99.04

FINISHED STEEL—ANNUAL PRICE AVERAGES

(Per net ton, Pittsburgh)

	SHEETS			STRIP		Tin	BARS				Basic	Standard
	H.R.	C.R.	Gal.	H.R.	C.R.	Plate	H.R.	C.F.	Plates	Shapes	Wire	Nails
1956	$89.27	$109.86	$120.56	$89.27	$194.75	$194.67	$96.35	$129.95	$92.77	$95.17	$126.75	$157.19
1955	83.75	102.75	112.00	83.75	120.12	183.00	89.50	113.00	87.25	88.50	120.00	144.50
1954	79.75	97.25	107.25	79.75	112.00	179.50	84.50	106.00	83.25	83.50	112.75	134.00
1953	77.60	93.70	103.70	85.34	111.25	179.00	81.20	101.52	80.20	79.75	108.26	129.08
1952	74.52	88.95	98.38	79.51	104.39	176.17	76.17	94.25	75.73	74.73	101.88	123.03
1951	73.00	87.00	96.00	77.60	101.60	174.00	74.00	91.00	74.00	73.00	98.60	120.00
1950	67.50	82.42	88.67	68.33	86.29	150.00	69.42	83.29	70.33	68.42	91.13	107.67
1949	65.22	80.08	88.00	67.75	84.33	155.00	67.55	80.04	68.75	65.24	84.05	105.92
1948	60.17	74.83	82.80	62.40	80.36	135.75	62.84	75.63	63.84	60.17	80.10	107.33
1947	52.60	67.03	74.05	52.60	67.03	116.00	54.60	67.03	55.53	52.53	70.67	84.44
1946	48.03	64.80	79.50	47.33	60.56	104.38	49.46	61.21	49.38	46.38	60.25	69.61
1945	43.92	61.00	73.50	42.00	56.00	100.00	44.25	53.83	44.50	42.00	53.83	57.08
1944	42.00	61.00	70.00	42.00	56.00	100.00	43.00	53.00	42.00	42.00	52.00	51.00
1943	42.00	61.00	70.00	42.00	56.00	100.00	43.00	53.00	42.00	42.00	52.00	51.00
1942	42.00	61.00	70.00	42.00	56.00	100.00	43.00	53.00	42.00	42.00	52.00	51.00
1941	42.00	61.00	70.00	42.00	56.00	100.00	43.00	53.00	42.00	42.00	52.00	51.00
1940	41.80	60.80	70.00	41.75	55.75	100.00	43.00	53.00	42.00	42.00	52.00	51.00
1939	41.25	62.08	70.00	41.25	57.08	100.00	43.75	53.33	42.00	42.00	52.00	49.17
1938	45.42	66.67	72.92	45.25	61.08	106.00	47.00	56.00	43.50	43.50	55.00	52.00
1937	47.08	69.92	74.50	47.08	62.75	104.33	48.08	56.75	44.25	44.25	56.92	53.25
1936	38.25	60.00	63.25	38.25	52.33	105.00	38.50	44.42	37.00	37.00	48.17	42.83
1935	37.00	59.00	62.00	37.00	52.00	105.00	36.33	40.00	36.00	36.00	46.00	50.58
1934	37.08	58.75	61.25	37.17	51.75	105.00	36.17	42.00	35.67	35.67	45.42	50.58

COMPARISON OF PRICE COMPOSITES



FINISHED STEEL—ARITHMETICAL PRICE COMPOSITE

(In dollars per net ton, computed from industry-wide prices on carbon steel: Hot-rolled sheets, cold-rolled sheets, cold-rolled strip, hot-rolled bars, plates, structural shapes, basic wire, standard nails, tin plate and standard and line pipe. Based on basing point prices through June, 1948; mill prices for subsequent months.)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Avg.
1956.......	$128.02	$128.02	$128.02	$128.02	$128.98	$128.98	$130.85	$136.28	$137.75	$137.48	$137.66	$137.66	$132.31
1955.......	117.82	117.82	118.40	118.45	118.45	118.45	124.59	127.41	127.41	128.14	128.14	127.75	122.74
1954.......	113.91	113.91	113.75	113.70	113.70	113.20	117.52	117.74	117.77	117.95	117.95	117.95	115.75
1953.......	110.98	110.98	110.98	110.98	111.13	112.49	112.51	115.56	115.56	115.42	115.18	114.41	113.02
1952.......	106.32	106.32	106.32	106.32	106.32	106.32	107.25	110.98	110.98	110.98	110.98	110.98	108.34
1951.......	106.32	106.32	106.32	106.32	106.32	106.32	106.32	106.32	106.32	106.32	106.32	106.32	106.32
1950.......	92.92	93.09	93.18	93.19	93.65	94.35	94.36	94.44	94.50	94.91	95.09	100.76	94.54
1949.......	97.75	97.77	97.17	94.18	93.36	92.06	91.82	91.62	91.55	91.62	91.64	91.89	93.54
1948.......	78.26	79.86	81.14	81.14	80.27	80.27	86.18	95.05	95.05	95.05	95.16	95.50	86.91
1947.......	69.59	69.82	69.82	69.82	69.82	69.82	70.80	75.41	75.41	75.41	76.09	76.15	72.33
1946.......	58.27	60.91	63.54	63.54	63.54	64.09	64.45	64.45	64.45	64.45	64.45	64.75	63.41
1945.......	57.35	57.55	57.55	57.55	57.73	58.27	58.27	58.27	58.27	58.27	58.27	58.27	57.97

STEELMAKING SCRAP PRICE COMPOSITE

Average of No. 1 heavy melting steel scrap prices (per gross ton) at Pittsburgh, Chicago, eastern Pennsylvania. December and 1956 averages are estimated.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Avg.
1956.......	$52.17	$48.96	$50.21	$54.90	$50.34	$46.04	$47.70	$57.13	$59.08	$57.27	$61.83	$64.00	$54.14
1955.......	34.95	36.79	37.50	36.73	34.87	35.44	39.67	43.97	44.42	45.17	46.08	50.37	40.50
1954.......	29.05	26.91	24.37	25.67	28.00	27.92	27.42	28.80	29.94	32.25	33.33	32.58	28.85
1953.......	43.00	43.00	44.05	42.88	39.17	40.50	43.51	43.40	36.93	32.75	35.00	32.10	39.69
1952.......	43.00	43.00	43.00	43.00	43.00	42.63	42.60	43.00	43.00	43.00	43.00	43.00	42.94
1951.......	46.33	44.00	44.00	44.00	44.00	44.00	44.00	44.00	44.00	43.60	43.00	43.00	43.99
1950.......	26.93	27.52	28.23	29.40	33.82	39.25	37.04	40.00	40.93	41.37	41.33	45.50	35.94
1949.......	41.54	38.48	34.60	24.06	22.29	20.85	19.21	20.86	26.07	26.71	28.96	28.03	27.64
1948.......	40.75	40.48	40.21	40.41	40.67	40.67	41.43	43.33	43.33	43.25	43.25	43.25	41.75
1947.......	31.20	33.50	37.25	33.94	29.75	32.48	37.23	39.00	37.83	39.85	40.42	40.13	36.05
1946.......	19.17	19.17	19.17	19.17	19.17	19.17	19.17	19.17	19.17	19.17	22.22	27.69	20.13
1945.......	19.17	19.17	19.17	19.17	19.17	19.17	19.17	19.17	19.17	19.17	19.17	19.17	19.17

BASIC PIG IRON PRICE COMPOSITE

Average of basic pig iron prices (per gross ton) at Bethlehem, Birmingham, Buffalo, Chicago, Cleveland, Pittsburgh, Granite City, Youngstown.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Avg.
1956.......	$58.49	$58.49	$56.63	$59.80	$59.80	$59.80	$59.93	$62.18	$62.18	$62.18	$62.18	$62.18	$60.32
1955.......	56.04	56.04	56.04	56.04	56.04	56.04	57.88	58.49	58.49	58.49	58.49	58.49	57.29
1954.......	56.04	56.04	56.04	56.04	56.04	56.04	56.04	56.04	56.04	56.04	56.04	56.04	56.04
1953.......	54.66	54.66	54.66	54.66	54.66	54.66	56.03	56.04	56.04	56.04	56.04	56.04	55.35
1952.......	52.16	52.16	52.16	52.16	52.16	52.16	52.66	54.66	54.66	54.66	54.66	54.66	53.24
1951.......	52.16	52.16	52.16	52.16	52.16	52.16	52.16	52.16	52.16	52.16	52.16	52.16	52.16
1950.......	45.70	45.97	45.97	45.97	45.97	45.97	45.97	45.97	47.08	47.98	49.04	52.16	46.98
1949.......	46.26	46.22	46.22	46.16	45.66	45.60	45.60	45.60	45.60	45.60	45.60	45.60	45.81
1948.......	38.50	39.30	39.34	39.21	39.66	40.49	41.42	44.12	44.62	46.19	46.29	46.29	42.12
1947.......	29.56	29.59	32.40	32.49	32.49	32.49	33.82	36.06	36.14	36.18	36.38	36.31	33.66
1946.......	24.75	24.75	25.13	25.50	25.50	27.50	27.50	27.50	27.50	27.50	27.50	29.10	26.64

MALLEABLE PIG IRON PRICE COMPOSITE

Average of malleable pig iron prices (per gross ton) at Bethlehem, Buffalo, Chicago, Cleveland, Pittsburgh, Granite City, Youngstown.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Avg.
1956.......	$59.77	$59.77	$59.93	$61.27	$61.27	$61.27	$61.52	$63.41	$63.41	$63.41	$63.41	$63.41	$61.82
1955.......	57.27	57.27	57.27	57.27	57.27	57.27	59.15	59.77	59.77	59.77	59.77	59.77	58.47
1954.......	57.27	57.27	57.27	57.27	57.27	57.27	57.27	57.27	57.27	57.27	57.27	57.27	57.27
1953.......	55.77	55.77	55.77	55.77	55.77	55.77	57.27	57.27	57.27	57.27	57.27	57.27	56.52
1952.......	53.27	53.27	53.27	53.27	53.27	53.27	53.77	55.77	55.77	55.77	55.77	55.77	54.35
1951.......	53.27	53.27	53.27	53.27	53.27	53.27	53.27	53.27	53.27	53.27	53.27	53.27	53.27
1950.......	47.27	47.27	47.27	47.27	47.27	47.27	47.33	47.49	48.15	49.46	50.27	53.27	48.30
1949.......	47.39	47.34	47.34	47.31	47.27	47.27	47.27	47.27	47.27	47.27	47.27	47.27	47.30
1948.......	39.58	40.39	40.45	40.29	40.70	41.54	42.32	44.87	45.30	47.20	47.41	47.41	43.12
1947.......	30.79	30.79	33.50	33.71	33.71	33.71	34.94	37.07	37.16	37.19	37.49	37.40	34.79
1946.......	26.04	26.04	26.41	26.79	26.79	28.79	28.79	28.79	28.79	28.79	28.79	30.36	27.93

No. 2 FOUNDRY PIG IRON PRICE COMPOSITE

Average of No. 2 foundry pig iron prices (per gross ton) at Bethlehem, Birmingham, Buffalo, Chicago, Cleveland, Neville Island, Granite City.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Avg.
1956.......	$58.99	$58.99	$59.15	$60.27	$60.27	$60.27	$60.95	$62.63	$62.63	$62.63	$62.63	$62.63	$61.00
1955.......	56.54	56.54	56.54	56.54	56.54	56.54	58.38	58.99	58.99	58.99	58.99	58.99	57.71
1954.......	56.54	56.54	56.54	56.54	56.54	56.54	56.54	56.54	56.54	56.54	56.54	56.54	56.54
1953.......	55.04	55.04	55.04	55.04	55.04	55.04	56.54	56.54	56.54	56.54	56.54	56.54	55.79
1952.......	52.54	52.54	52.54	52.54	52.54	52.54	53.04	55.04	55.04	55.04	55.04	55.04	53.62
1951.......	52.54	52.54	52.54	52.54	52.54	52.54	52.54	52.54	52.54	52.54	52.54	52.54	52.54
1950.......	46.20	46.47	46.47	46.47	46.47	46.47	46.57	46.85	47.55	49.20	49.54	52.54	47.57
1949.......	47.39	47.34	47.34	47.31	47.27	47.27	46.08	46.10	46.10	46.10	46.10	46.10	46.28
1948.......	38.94	39.77	39.81	39.68	40.10	40.96	41.83	44.47	44.58	46.50	46.69	46.69	42.50
1947.......	30.17	30.17	32.80	32.99	32.99	32.99	34.32	36.54	36.62	36.64	36.85	36.78	34.16
1946.......	25.42	25.42	25.80	26.17	26.17	28.17	28.17	28.17	28.17	28.17	28.17	29.73	27.31

Prices

METALWORKING FACTS AND FIGURES

AVERAGE MONTHLY QUOTATIONS IN 1956

Unless otherwise noted, finished steel prices are cents per pound, semifinished steel, coke and ammonium sulfate are dollars per net ton, other coal chemicals are in cents per unit stated, and pig iron and scrap in dollars per gross ton. All prices are mill or furnace, unless otherwise noted. December figures are subject to revision.

PITTSBURGH	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
Structural Shapes	4.60	4.60	4.60	4.60	4.60	4.60	4.60	4.90	5.00	5.00	5.00	5.00
Plates	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.763	4.85	4.85	4.85	4.85
Bars, Hot-Rolled, Merchant Quality	4.65	4.65	4.65	4.65	4.65	4.65	4.65	4.969	5.075	5.075	5.075	5.075
Bars, Cold-Finished	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.70	6.85	6.85	6.85	6.85
Sheets, Hot-Rolled	4.325	4.325	4.325	4.325	4.325	4.325	4.325	4.588	4.675	4.675	4.675	4.675
Sheets, Cold-Rolled	5.325	5.325	5.325	5.325	5.325	5.325	5.325	5.643	5.75	5.75	5.75	5.75
Sheets, Galvanized	5.85	5.85	5.85	5.85	5.85	5.85	5.85	6.188	6.30	6.30	6.30	6.30
Strip, Hot-Rolled	4.325	4.325	4.325	4.325	4.325	4.325	4.325	4.588	4.675	4.675	4.675	4.675
Strip, Cold-Rolled	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.70	6.85	6.85	6.85	6.85
Standard Spikes	7.90	7.90	7.90	8.05	8.05	8.05	8.05	8.594	8.775	8.775	8.775	8.775
Plain Wire	6.60	6.60	6.60	6.60	6.60	6.60	6.60	7.05	7.20	7.20	7.20	7.20
Wire Nails	7.60	7.60	7.60	7.60	7.60	7.60	7.60	8.163	8.35	8.20	8.20	8.20
Structural Rivets	9.95	9.95	9.95	9.95	9.95	9.95	9.95	10.625	10.85	10.85	10.85	10.85
Steel Pipe, Buttweld, 1-3 in.; % discount from list	26.50	26.50	26.50	26.50	26.50	26.50	26.50	22.00	20.50	20.50	20.50	20.50
Tin Plate, 1.50-lb coating (base box)	$9.45	$9.45	$9.45	$9.45	$9.85	$9.85	$9.85	$9.85	$9.85	$9.85	$9.95	$9.95
Pig Iron, Bessemer, Pittsburgh district ovens	59.50	59.50	59.50	61.00	61.00	61.00	62.00	63.50	63.50	63.50	63.50	63.50
Pig Iron, Basic, Pittsburgh district ovens	58.50	58.50	58.88	60.00	60.00	60.00	61.00	62.50	62.50	62.50	62.50	62.50
Pig Iron, No. 2 Foundry, Neville Island, Pa.	59.00	59.00	59.38	60.50	60.50	60.50	62.50	63.00	63.00	63.00	63.00	63.00
Pig Iron, Malleable, Neville Island, Pa.	59.00	59.00	59.38	60.50	60.50	60.50	61.50	63.00	63.00	63.00	63.00	63.00
Blast Furnace Silvery Pig Iron, 9.01-9.50% Si, Jackson, O., furnace	75.00	75.00	75.00	76.50	76.50	76.50	76.50	79.00	79.00	79.00	79.00	79.00
Billets, Bessemer and Open-Hearth, Rerolling	68.50	68.50	68.50	68.50	68.50	68.50	68.50	72.625	74.00	74.00	74.00	74.00
Wire Rods (cents per pound)	5.305	5.375	5.375	5.375	5.375	5.375	5.375	5.694	5.80	5.80	5.80	5.80
Coke, Furnace, Beehive, spot, Connellsville, Pa.	$14.125	$14.125	$14.125	$14.125	$14.125	$14.125	$14.125	$14.406	$14.50	$14.50	$14.875	$15.00
Coke, Foundry, Beehive, spot, Connellsville, Pa.	16.50	16.50	16.50	16.50	16.50	16.50	16.50	17.25	17.50	17.50	17.875	18.00
Scrap, No. 1 Heavy Melting Steel	52.00	48.63	49.88	54.50	48.75	44.50	46.90	56.38	58.00	56.30	62.50	66.00
Scrap, Low Phos. (Punchings and Plate)	59.10	57.25	57.50	63.10	59.75	53.00	53.90	67.75	67.75	67.30	71.25	72.50
Scrap, No. 1 Cupola	47.70	48.50	49.75	52.30	51.00	50.00	48.50	50.50	55.00	52.70	52.00	52.00

CHICAGO	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
Bars, Hot-Rolled, Merchant Quality	4.65	4.65	4.65	4.65	4.65	4.65	4.65	4.969	5.075	5.075	5.075	5.075
Plates	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.763	4.85	4.85	4.85	4.85
Structural Shapes	4.60	4.60	4.60	4.60	4.60	4.60	4.60	4.90	5.00	5.00	5.00	5.00
Bars, Merchant, Rail Steel	4.65	4.65	4.65	4.65	4.65	4.65	4.65	4.969	5.075	5.075	5.075	5.075
Sheets, Cold-Rolled	5.325	5.325	5.325	5.325	5.325	5.325	5.325	5.643	5.75	5.75	5.75	5.75
Pig Iron, No. 2 Foundry	$59 00	$59.00	$59.38	$60.50	$60.50	$60.50	$61.25	$63.00	$63.00	$63.00	$63.00	$63.00
Pig Iron, Malleable	59.00	59.00	59.38	60.50	60 50	60.50	61.25	63.00	63.00	63.00	63.00	63.00
Oven Foundry Coke, delivered from St. Paul	29.82	29.82	29.82	29.82	29.82	29.82	29.82	31.82	31.82	31.82	31.82	31.82
Scrap, No. 1 Heavy Melting Steel	49.90	47.50	49.75	54.50	49.88	46.00	46.80	57.75	60.50	58.60	63.38	65.00
Scrap, Rails for Rerolling	70.80	66.13	67.75	72.50	72.00	68.25	68.70	80.75	84.25	84.30	87.88	89.00
Scrap, No. 1 Cupola Cast	50.50	46.50	48.00	51.90	49.50	45.50	46.30	52.75	53.50	50.70	50.50	50.50

EASTERN PENNSYLVANIA	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
Plates, Sparrows Point, Md.	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.763	4.85	4.85	4.85	4.85
Structural Shapes, deld. Philadelphia	4.88	4.88	4.97	5.00	5.00	5.00	5.00	5.30	5.40	5.40	5.40	5.40
Steel Bars, deld. Philadelphia	4.90	4.90	4.92	4.93	4.93	4.93	4.93	5.249	5.355	5.355	5.355	5.355
Sheets, Hot-Rolled, Sparrows Point, Md.	4.325	4.325	4.325	4.325	4.325	4.325	4.325	4.588	4.675	4.675	4.675	4.675
Pig Iron, Basic, deld. Philadelphia	$62.16	$62.16	$62.56	$63.76	$63.76	$63.76	$65.26	$66.26	$66.26	$66.26	$66.26	$66.26
Pig Iron, No. 2 Foundry, deld. Philadelphia	62.66	62.66	63.06	64.26	64.26	64.26	65.76	66.76	66.76	66.76	66.76	66.76
Pig Iron, Standard Low Phos, deld. Philadelphia	70.05	70.05	70.43	71.55	71.55	71.55	71.55	74.05	74.05	74.05	74.05	74.05
Oven Foundry Coke, Kearny, N. J.	26.75	26.75	26.75	26.75	26.75	26.75	26.75	28.25	28.75	28.75	28.75	28.75
Scrap, No. 1 Heavy Melting Steel	49.90	47.50	49.75	54.50	49.88	46.00	46.80	57.75	60.50	58.60	59.63	62.50
Scrap, No. 1 Cupola Cast	50.50	46.50	48.00	51.90	49.50	45.50	46.30	52.75	53.50	50.70	53.00	53.00
Spiegeleisen, 19-21%, Palmerton, Pa., furnace	91.50	91.50	91.50	94.00	94.00	94.00	94.00	95.50	96.00	99.50	99.50	99.50

COAL CHEMICALS	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
Benzene, per gallon, producers' plants, tank lots	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00
Toluene, one degree, per gallon, producers' plants	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00
Xylene, per gallon, producers' plants, tank lots	33.50	33.50	33.50	33.50	33.50	33.50	33.50	33.50	33.50	33.50	33.50	33.50
Phenol, Grade 5, per pound, producers' plants	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25	15.25
Ammonium Sulfate, per ton, bulk, ovens	43.50	43.50	43.50	43.50	37.75	32.00	32.00	32.00	32.00	32.00	32.00	32.00

Nonferrous Prices

NONFERROUS METAL PRICES

(Cents per pound)

	1956												Yearly Averages		
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.*	1956*	1955	1954
Copper Sheets[1]	63.33	65.51	67.51	68.63	67.51	67.13	62.73	61.63	61.63	60.83	57.63	58.13	63.52	56.60	48.41
Copper Rods[8]	60.56	61.99	64.74	65.86	64.74	64.36	59.96	58.86	58.86	58.06	54.86	55.36	60.68	54.00	46.01
Copper Tubing[1]	63.52	64.95	67.70	68.82	67.70	67.32	62.92	61.82	61.82	61.02	57.82	58.32	63.64	56.67	48.47
Yellow Brass Sheets[1]	52.54	53.94	55.85	56.60	55.85	55.60	52.80	52.10	52.10	51.57	49.44	50.19	53.22	47.70	41.77
Yellow Brass Rods[1]	42.77	44.14	45.88	46.58	45.88	45.65	43.25	42.65	42.65	42.15	40.17	40.17	43.50	38.45	38.08
Yellow Brass Tubing[1]	55.45	56.84	58.76	59.51	58.76	58.51	55.71	55.01	55.01	54.48	52.35	53.10	56.12	50.61	44.68
Nickel Silver Sheets[3]	66.25	67.58	69.44	69.97	70.16	70.16	68.24	67.76	67.76	67.24	65.16	65.91	67.97	61.53	55.75
Phosphor Bronze Sheets[4]	81.30	83.04	85.73	86.65	85.39	84.92	80.65	79.58	79.58	78.91	76.25	77.25	81.60	74.85	66.64
Zinc Sheets[1]	23.40	23.50	23.50	23.90	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	23.86	23.00	23.00
Bronze Sheets[2]	60.40	61.82	64.32	65.33	64.32	63.98	60.06	59.08	59.08	58.36	55.48	56.23	60.71	54.46	46.99
Bronze Rods[2]	60.34	61.76	64.26	65.27	64.26	63.92	60.00	59.02	59.02	58.30	55.42	56.17	60.65	54.40	46.93
Bronze Tubing[2]	62.96	64.38	66.62	67.24	66.88	66.54	62.62	61.64	61.64	60.92	58.04	58.79	63.19	57.02	49.55
Yellow Brass Wire[1]	53.08	54.47	56.39	57.14	56.39	56.14	53.34	52.64	52.64	52.11	49.98	50.73	53.75	48.24	42.31
Copper Magnet Wire[5]	55.52	56.71	59.47	59.15	58.68	58.68	53.88	52.68	52.68	51.88	48.68	48.68	54.72	49.84	41.83
Weatherproof Copper Wire[6]	46.28	46.97	48.84	48.62	48.28	48.28	44.68	43.78	43.78	43.18	40.78	40.78	45.35	42.48	36.53
Bare Copper Wire[6]	48.88	49.63	52.11	51.80	51.36	51.36	46.56	45.36	45.36	44.56	41.36	41.36	47.48	43.21	35.48
No. 115 Brass Ingot[7]	42.00	42.50	44.00	42.50	39.63	36.25	35.91	37.55	37.55	36.32	35.00	35.00	38.68	37.25	26.92
No. 305 Brass Ingot[7]	45.75	46.25	47.75	46.15	42.88	39.50	39.20	41.00	41.00	39.80	38.50	38.50	42.19	40.95	31.38
No. 405 Brass Ingot[7]	33.25	33.63	34.75	33.55	31.50	30.75	30.55	29.75	29.75	28.65	27.50	27.50	30.93	31.14	22.98

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*Estimated.

[1] F.o.b. mill. [2] 90% Cu; f.o.b. mill. [3] 10% Ni; f.o.b. mill. [4] Grade A; f.o.b. mill. [5] Carlots; f.o.b. destination. [6] Carlots; f.o.b. eastern mill. [7] Delivered. [8] Cold-drawn; f.o.b. mill.

COPPER

Electrolytic; cents per lb, delivered
Connecticut Valley

	1956	1955	1954	Yearly Averages
Jan.	46.700	30.180	29.750	1956* .42.465
Feb.	48.076	33.000	29.750	1955. .38.217
Mar.	49.727	33.222	29.865	1954. .29.777
Apr.	47.500	36.000	29.955	1953. .29.037
May	45.096	36.000	30.000	1952. .24.500
June	43.000	36.000	30.000	1951. .24.500
July	40.030	36.000	30.000	1950. .21.588
Aug.	39.750	37.759	30.000	1949. .19.499
Sept.	39.500	45.380	30.000	1948. .22.317
Oct.	38.365	44.594	30.000	1947. .21.215
Nov.	35.956	44.420	30.000	1946. .14.043
Dec.	35.875*	46.053	30.000	1945. .12.000

ZINC

Prime Western; cents per lb, East St. Louis

	1956	1955	1954	Yearly Averages
Jan.	13.440	11.500	9.760	1956* .13.495
Feb.	13.500	11.500	9.369	1955. .12.303
Mar.	13.500	11.500	9.657	1954. .10.721
Apr.	13.500	11.927	10.250	1953. .10.851
May	13.500	12.000	10.290	1952. .16.213
June	13.500	12.250	10.923	1951. .17.994
July	13.500	12.500	11.000	1950. .13.879
Aug.	13.500	12.500	11.000	1949. .12.152
Sept.	13.500	12.940	11.900	1948. .13.563
Oct.	13.500	13.020	11.500	1947. .10.500
Nov.	13.500	13.000	11.500	1946. . .8.727
Dec.	13.500*	13.000	11.500	1945. . .8.250

CADMIUM

Regular shapes; dollars per lb, del.

	1956	1955	1954	1953	1952	1951
Jan.	1.70	1.70	2.00	1.94	2.55	2.55
Feb.	1.70	1.70	1.70	2.00	2.55	2.55
Mar.	1.70	1.70	1.70	2.00	2.55	2.55
Apr.	1.70	1.70	1.70	2.00	2.55	2.55
May	1.70	1.70	1.70	2.00	2.40	2.55
June	1.70	1.70	1.70	2.00	2.25	2.55
July	1.70	1.70	1.70	2.00	2.20	2.55
Aug.	1.70	1.70	1.70	2.00	2.00	2.55
Sept.	1.70	1.70	1.70	2.00	2.00	2.55
Oct.	1.70	1.70	1.70	2.00	2.00	2.55
Nov.	1.70	1.70	1.70	2.00	2.00	2.55
Dec.	1.70*	1.70	1.70	2.00	1.80	2.55
Avg.	1.70*	1.70	1.72	1.99	2.24	2.55

ANTIMONY

Domestic, bulk, carlots; cents per lb,
f.o.b. Laredo, Tex.

	1956	1955	1954	Yearly Averages
Jan.	33.000	28.500	28.500	1956* .33.000
Feb.	33.000	28.500	28.500	1955. .30.150
Mar.	33.000	28.500	28.500	1954. .28.500
Apr.	33.000	28.500	28.500	1953. .33.932
May	33.000	28.500	28.500	1952. .42.112
June	33.000	28.500	28.500	1951. .42.335
July	33.000	28.500	28.500	1950. .27.626
Aug.	33.000	30.300	28.500	1949. .36.875
Sept.	33.000	33.000	28.500	1948. .35.010
Oct.	33.000	33.000	28.500	1947. .31.922
Nov.	33.000	33.000	28.500	1946. .15.972
Dec.	33.000*	33.000	28.500	1945. .14.500

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*Estimated.

ALUMINUM

99% plus, ingots; cents per lb, f.o.b.
shipping point

	1956	1955	1954	Yearly Averages
Jan.	24.400	22.900	21.500	1956* .25.908
Feb.	24.400	23.200	21.500	1955. .23.664
Mar.	24.650	23.200	21.500	1954. .21.785
Apr.	24.650	23.200	21.500	1953. .20.925
May	25.900	23.200	21.500	1952. .19.410
June	25.900	23.200	21.500	1951. .19.000
July	25.900	23.200	21.500	1950. .17.695
Aug.	26.700	24.267	22.119	1949. .17.000
Sept.	27.100	24.400	22.200	1948. .15.764
Oct.	27.100	24.000	22.200	1947. .15.000
Nov.	27.100	24.400	22.200	1946. .15.000
Dec.	27.100*	24.400	22.200	1945. .15.000

LEAD

Common grade; cents per lb, St. Louis

	1956	1955	1954	Yearly Averages
Jan.	15.960	14.800	13.060	1956* .15.813
Feb.	15.800	14.800	12.610	1955. .14.940
Mar.	15.800	14.800	12.735	1954. .13.854
Apr.	15.800	14.800	13.710	1953. .13.283
May	15.800	14.800	13.800	1952. .16.268
June	15.800	14.800	13.906	1951. .17.294
July	15.800	14.800	13.800	1950. .13.095
Aug.	15.800	14.800	13.846	1949. .15.191
Sept.	15.800	14.920	14.400	1948. .17.867
Oct.	15.800	15.300	14.775	1947. .14.504
Nov.	15.800	15.300	14.800	1946. . .7.957
Dec.	15.800*	15.358	14.800	1945. . .6.350

COBALT

97-99%; dollars per lb for 550 lb keg

	1956	1955	1954	1953	1952	1951
Jan.	2.60	2.60	2.60	2.40	2.40	2.10
Feb.	2.60	2.60	2.60	2.40	2.40	2.10
Mar.	2.60	2.60	2.60	2.40	2.40	2.10
Apr.	2.60	2.60	2.60	2.40	2.40	2.10
May	2.60	2.60	2.60	2.40	2.40	2.10
June	2.60	2.60	2.60	2.40	2.40	2.10
July	2.60	2.60	2.60	2.40	2.40	2.10
Aug.	2.60	2.60	2.60	2.40	2.40	2.10
Sept.	2.60	2.60	2.60	2.40	2.40	2.10
Oct.	2.60	2.60	2.60	2.40	2.40	2.40
Nov.	2.60	2.60	2.60	2.60	2.40	2.40
Dec.	2.60*	2.60	2.60	2.60	2.40	2.40
Avg.	2.60*	2.60	2.60	2.43	2.40	2.18

SILVER

Open market, cents per fine oz., New York

	1956	1955	1954	Yearly Averages
Jan.	90.381	85.250	85.250	1956* .90.839
Feb.	91.043	85.250	85.250	1955. .89.062
Mar.	91.148	86.880	85.250	1954. .85.250
Apr.	90.880	87.000	85.250	1953† .85.188
May	90.750	88.882	85.250	1952† .84.941
June	90.461	89.688	85.250	1951† .89.368
July	90.135	90.438	85.250	1950† .74.165
Aug.	90.588	90.750	85.250	1949† .71.930
Sept.	90.750	90.795	85.250	1948† .74.361
Oct.	91.178	91.800	85.250	1947† .71.820
Nov.	91.375	91.500	85.250	1946† .80.151
Dec.	91.375*	90.510	85.250	1945† .51.928

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*Estimated.

†As reported by Handy & Harman, New York.

NICKEL

Electrolytic cathodes, 99.5%, base sizes,
unpacked, cents per lb, f.o.b. refinery

	1956	1955	1954	Yearly Averages
Jan.	64.500	64.500	60.000	1956* .65.292
Feb.	64.500	64.500	60.000	1955. .64.500
Mar.	64.500	64.500	60.000	1954. .60.450
Apr.	64.500	64.500	60.000	1953. .59.888
May	64.500	64.500	60.000	1952. .56.500
June	64.500	64.500	60.000	1951. .54.000
July	64.500	64.500	60.000	1950. .44.809
Aug.	64.500	64.500	60.000	1949. .40.000
Sept.	64.500	64.500	60.000	1948. .36.528
Oct.	64.500	64.500	60.000	1947. .35.000
Nov.	64.500	64.500	60.900	1946. .31.850
Dec.	74.000*	64.500	64.500	1945. .35.000

TIN

Straits, spot; cents per lb, New York

	1956	1955	1954	Yearly Averages
Jan.	105.067	87.280	85.100	1956* 101.978
Feb.	100.908	90.908	85.181	1955. .94.939
Mar.	100.606	91.176	92.518	1954. .91.936
Apr.	99.270	91.458	96.260	1953. .95.925
May	97.024	91.410	93.600	1952. 120.492
June	94.611	93.668	94.178	1951. 127.072
July	96.435	97.045	96.558	1950. .95.552
Aug.	99.043	96.519	93.332	1949. .99.996
Sept.	103.745	96.565	93.545	1948. .99.250
Oct.	105.981	96.230	93.110	1947. .77.975
Nov.	111.049	97.825	91.196	1946. .54.563
Dec.	110.000*	107.980	88.649	1945. .52.000

IRIDIUM

Dollars per troy ounce

	1956	1955	1954	1953	1952
Jan.	110.00	115.00	170.00	180.00	200.00
Feb.	106.25	121.50	170.00	180.00	200.00
Mar.	105.00	105.00	156.50	180.00	200.00
Apr.	105.00	105.00	147.50	177.50	200.00
May	105.00	103.00	147.50	170.00	200.00
June	105.00	95.00	147.50	170.00	200.00
July	105.00	95.00	147.50	170.00	200.00
Aug.	100.00	97.00	147.50	170.00	200.00
Sept.	100.00	100.00	147.50	170.00	200.00
Oct.	100.00	102.00	147.50	170.00	200.00
Nov.	100.00	110.00	147.50	170.00	185.00
Dec.	105.00*	110.00	123.12	170.00	180.00
Avg.	103.85	104.88	149.97	173.13	197.08

PLATINUM

Dollars per ounce

	1956	1955	1954	1953	1952	1951
Jan.	106.50	82.13	92.00	91.50	91.50	91.50
Feb.	104.50	81.00	92.00	91.50	91.50	91.50
Mar.	104.00	78.00	87.90	91.50	91.50	91.50
Apr.	103.90	78.00	85.50	91.50	91.50	91.50
May	105.75	77.90	85.50	91.50	100.50	91.50
June	106.50	78.13	85.50	91.50	94.50	91.50
July	106.50	81.38	85.50	93.00	91.50	91.50
Aug.	106.50	83.50	83.50	92.00	91.50	91.50
Sept.	106.00	90.63	85.50	92.00	91.50	91.50
Oct.	105.50	94.30	85.50	92.00	91.50	91.50
Nov.	105.50	102.75	85.50	92.00	91.50	91.50
Dec.	105.00*	107.00	101.00	92.00	91.50	91.50
Avg.	105.51*	86.23	86.60	91.83	92.50	91.50

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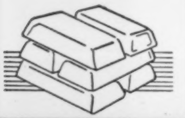
*Estimated.



COPPER PRODUCTION, SHIPMENTS AND STOCKS

DOMESTIC STATISTICS—Net Tons

Period	PRODUCTION Primary	Secondary	Refined	Deliveries To Customers	Refined Stocks End of Period
1956					
10 mos..	950,176	118,217	1,317,478	1,251,781(a)	106,120
Jan. ...	98,364	10,353	123,798	130,431(a)	50,016
Feb. ...	91,174	11,697	127,967	139,433(a)	47,053
Mar. ...	102,459	12,596	143,558	139,453(a)	53,263
Apr. ...	98,578	13,780	143,330	143,049(a)	56,731
May ...	101,422	17,475	145,740	142,961(a)	56,208
June ...	98,496	12,471	136,713	131,299(a)	60,671
July ...	84,787	10,387	125,401	97,698(a)	87,944
Aug. ...	91,282	9,545	122,108	109,618	96,450
Sept. ...	88,659	7,367	112,484	104,486	93,202
Oct. ...	94,955	12,546	136,379	113,353	106,120
1955	1,036,702	124,760	1,467,448	1,446,354(a)	61,554
1954	863,721	102,472	1,311,031	1,208,755(a)	47,108
1953	957,318	110,475	1,395,003	1,443,719(a)	89,193
1952	961,886	46,003	1,189,112	1,445,834(a)	58,858
1951	964,589	56,910	1,199,784	1,367,787	71,528
1950	940,249	117,439	1,270,768	1,371,464	49,040
1949	772,986	135,052	1,056,463	1,031,595	116,027
1948	850,088	130,410	1,233,697	1,344,445	96,080
1947	871,391	105,307	1,196,393	1,383,666	76,035
1946	618,757	32,503	604,071	1,261,830	80,832

FOREIGN STATISTICS—Net Tons

Period	PRODUCTION Primary	Secondary	Refined	Deliveries To Customers	Refined Stocks End of Period
1956					
10 mos.	1,426,654	10,916	1,164,572	1,102,727	227,087
Jan. ..	137,010	897	113,502	111,883	167,299
Feb. ..	140,434	1,808	115,541	97,458	179,633
Mar. ..	143,995	1,697	114,435	120,224	174,232
Apr. ..	137,487	936	114,430	102,317	183,238
May ..	135,755	1,133	124,106	113,284	195,922
June ..	140,318	1,136	114,669	105,415	205,550
July ..	148,395	787	115,232	101,102	215,281
Aug. ..	150,013	460	120,706	114,928	219,122
Sept. ..	132,742	759	105,038	114,993	216,149
Oct. ..	160,350	1,303	126,913	121,012	227,087
1955	1,576,960	8,305	1,260,861	1,298,037	159,777
1954	1,494,386	5,273	1,155,516	1,247,120	181,529
1953	1,441,874	13,238	1,120,066	831,441	280,530
1952	1,401,001	9,582	1,196,426	1,005,259	130,103

Total Domestic and Foreign

1956					
10 mos.	2,376,830	129,133	2,482,050	2,354,508	333,207
1955	2,613,662	133,065	2,728,309	2,744,391	221,331
1954	2,358,107	107,745	2,466,547	2,455,875	228,637
1953	2,399,192	123,713	2,515,069	2,275,160	369,723
1952	2,362,887	55,585	2,385,538	2,451,093	188,961

Copper Institute. (a)—Includes tonnages delivered from government stocks and by importers.

Imports of Copper

Unrefined, Scrap, Refined—Net Tons

	1956	1955	1954	1953	1952	1951
Jan.	32,195	39,307	34,790	50,055	49,580	45,886
Feb.	48,674	46,082	55,868	62,345	41,941	44,872
Mar.	44,170	45,273	43,384	52,387	48,272	36,600
Apr.	47,881	44,027	45,975	70,191	42,970	43,812
May	52,446	45,340	51,989	67,662	37,172	46,771
June	52,992	49,368	81,833	80,943	33,061	50,544
July	49,324	46,581	62,228	66,200	66,380	46,606
Aug.	57,998	55,089	55,391	48,305	61,122	58,969
Sept.	.....	63,663	54,436	57,379	67,817	46,566
Oct.	.....	52,500	30,805	50,810	59,910	42,943
Nov.	.....	57,114	43,540	32,226	59,230	39,714
Dec.	.....	58,050	46,755	32,105	70,300	36,021
Monthly Avg.	.....	50,200	50,583	55,884	53,146	44,942

U.S. Bureau of the Census.

Exports of Copper

Refined, Scrap, Brass and Bronze Ingots—Net Tons

	1956	1955	1954	1953	1952	1951
Jan.	18,554	26,929	30,472	8,079	10,598	8,729
Feb.	21,659	37,375	25,499	6,030	12,842	16,027
Mar.	21,686	25,673	19,043	8,645	15,303	14,457
Apr.	18,040	27,095	31,235	6,551	19,494	17,652
May	30,303	30,233	29,712	8,669	20,252	14,041
June	17,703	19,323	26,046	7,278	18,347	13,162
July	16,031	13,819	24,183	13,317	15,435	13,535
Aug.	.....	15,399	27,121	18,064	14,604	6,714
Sept.	.....	22,294	16,783	18,249	20,945	4,971
Oct.	.....	20,405	25,867	18,870	18,226	9,864
Nov.	.....	19,340	18,883	15,898	13,016	16,488
Dec.	.....	19,142	23,562	20,416	16,257	16,599
Monthly Avg.	.....	23,086	24,866	12,506	16,277	12,687

U.S. Bureau of the Census.

Brass Ingot Shipments

Net Tons

	1956	1955	1954	1953
Jan.	27,736	25,201	20,661	24,423
Feb.	24,949	25,349	19,920	25,429
Mar.	28,310	29,713	23,653	28,256
Apr.	25,808	27,641	24,746	25,044
May	23,437	23,708	22,269	21,660
June	18,842	23,141	22,348	20,818
July	17,364	18,513	17,074	19,321
Aug.	23,812	27,013	21,684	20,156
Sept.	20,929	26,349	22,464	21,463
Oct.	23,045	25,228	24,080	22,280
Nov.	.....	25,102	23,061	21,860
Dec.	.....	21,448	21,273	20,541
Total	.....	298,406	263,233	271,251

Compiled by Ingot Brass & Bronze Industry, representing in excess of 95 per cent of brass and bronze industry.

Copper Consumption in U.S.

Refined Metal—Net Tons

	1955	1954	1953
Brass Mills	647,044	545,645	689,477
Wire Mills	812,663	668,601	753,029
Chemical Plants.	1,744	2,329	3,849
Secondary Smelters	6,827	7,434	15,305
Foundries & Misc.	33,726	30,720	32,555
Total	1,502,004	1,254,729	1,494,215

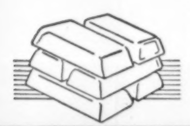
U.S. Bureau of Mines.

Copper and Brass Mill Fabricator Statistics

(Summary of statistics which cover United States duty-free and duty-paid foreign copper until January, 1947; copper from all sources, duty free, thereafter. Figures given in net tons.)

	DELIVERIES Deliveries to Users (actual consump.)	Producer Deliveries to Fabricators	STOCKS AT END OF PERIOD Fabricators' Refined Stocks	Less Working Stocks	Visible Supplies	Plus Undelivered Purchases	Total Stocks and Purchases	Unfilled Orders
1956								
10 mos.	1,198,230	1,251,781	440,081	336,856	103,225	112,893	216,118	198,653
Jan.	138,600	130,431	376,753	312,128	64,625	143,815	208,440	305,942
Feb.	130,973	139,433	388,823	319,279	69,544	135,637	205,181	282,314
Mar.	133,600	139,453	392,143	319,056	73,087	140,348	213,435	291,465
Apr.	121,961	143,049	413,979	319,247	94,732	135,071	229,803	266,239
May	124,627	142,961	435,083	318,592	116,491	131,023	247,514	249,352
June	113,835	131,299	451,126	324,970	126,156	114,223	240,379	227,097
July	81,275	97,698	465,015	334,584	130,421	109,040	239,461	220,810
Aug.	117,427	109,618	457,679	338,818	118,861	115,295	234,156	221,975
Sept.	115,867	104,486	445,679	338,488	107,191	114,981	222,172	204,154
Oct.	120,065	113,353	440,081	336,856	103,225	112,893	216,118	198,653
1955	1,412,287	1,440,400	389,974	314,145	75,829	139,094	214,923	293,264
Jan.	136,539	113,949	334,105	302,658	31,447	66,122	97,569	159,016
Feb.	118,786	108,503	323,425	301,597	21,828	75,890	96,718	179,948
Mar.	143,544	131,354	311,235	301.937	9,298	85,859	95,157	187,827
Apr.	115,073	119,863	316,575	304,117	12,458	88,992	101,450	205,308
May	113,485	124,853	327,343	309,219	18,124	111,715	129,839	232,279
June	132,377	132,842	327,696	309,972	17,724	126,703	144,427	234,578
July	75,846	60,143	312,587	301,048	11,539	165,505	177,044	286,095
Aug.	98,330	89,990	304,097	303,089	1,008	150,854	151,862	283,653
Sept.	113,628	144,571	334,996	314,111	20,885	133,391	154,276	270,102
Oct.	115,341	133,834	353,469	313,048	40,421	135,075	175,500	275,255
Nov.	122,332	141,807	373,314	313,779	59,535	139,855	199,390	283,953
Dec.	127,006	138,803	389,974	314,145	75,829	139,094	214,923	293,264
1954	1,231,840	1,208,755	360,526	304,619	55,907	58,125	114,032	136,581
1953	1,375,869	1,443,719	380,881	309,664	71,217	25,022	96,239	170,917
1952	1,391,477	1,445,834	331,499	292,157	39,342	32,652	71,994	275,608
1951	1,394,960	1,367,787	280,402	295,385	—14,983	32,147	17,164	303,050
1950	1,438,237	1,371,464	290,241	288,392	1,849	92,372	94,221	313,052
1949	1,053,225	1,031,595	354,992	285,298	69,694	82,793	152,487	189,407
1948	1,394,307	1,344,445	379,346	295,958	83,388	81,496	164,884	315,944
1947	1,338,383	1,383,666	423,432	293,859	129,573	103,765	233,338	338,260
1946	1,231,225	1,260,921	411,013	286,418	124,595	59,421	184,016	526,648
1945	1,462,440	1,517,842	375,618	268,490	107,128	44,100	151,228	362,436
1944	1,656,052	1,636,295	334,017	289,160	44,857	53,538	98,395	285,654

Copper Institute.



Nonferrous Metals

METALWORKING FACTS AND FIGURES

Slab Zinc

Net Tons

Commencing with January, 1948, all regularly operating United States primary and secondary smelters are included. Production from foreign ores is included commencing with 1940.

	Stock Beginning	Production	SHIPMENTS Domestic	SHIPMENTS Export & Drawback	SHIPMENTS Gov't. Acc't.	SHIPMENTS Total	Unfilled Orders at End
1956* ...	40,979	1,058,000	872,000	9,000	143,000	1,024,000	60,000
Jan. ..	40,979	90,313	87,723	1,084	1,155	89,962	60,717
Feb. ..	41,330	86,329	84,727	317	2,782	87,826	45,255
Mar. .	39,833	91,690	84,204	460	6,821	91,485	53,070
Apr. ..	40,038	88,664	74,788	1,437	4,570	80,795	46,106
May ..	47,907	81,238	59,085	287	10,196	69,568	34,003
June ..	59,577	78,321	53,048	539	15,085	68,672	45,921
July ..	69,226	83,080	34,219	811	14,501	49,531	53,559
Aug. .	102,775	89,549	70,707	1,235	16,075	88,017	55,769
Sept. .	104,307	90,235	73,142	934	18,301	92,377	64,450
Oct. ..	102,165	93,493	84,991	465	21,392	106,848	53,425
1955	124,277	1,031,018	1,007,619	19,496	87,200	1,114,316	72,908
1954	180,843	868,242	787,922	27,929	108,957	924,808	45,862
1953	87,160	971,191	818,850	16,326	42,332	877,508	35,466
1952	21,901	961,430	803,343	56,202	36,626	896,171	45,264
1951	8,884	931,833	836,800	42,067	39,949	918,816	50,909
1950	94,221	910,363	849,255	18,189	128,256	995,700	74,795
1949	20,848	870,113	648,285	56,929	91,526	796,740	42,625
1948	68,647	850,105	770,396	69,910	57,598	897,904	51,318
1947	175,800	848,027	698,281	117,305	140,230	955,816	59,705
1946	259,391	759,346	714,292	66,638	62,007	842,937	58,057
1945	237,520	799,520	762,925	9,422	5,302	777,649	27,092
1944	173,510	901,332	830,334	6,988	......	837,322	21,332
1943	89,275	971,873	831,430	56,208	......	887,638	44,914
1942	24,066	929,770	733,918	151,650	......	885,568	52,752
1941	17,582	863,955	751,276	106,195	......	857,471	87,666
1940	74,262	706,100	674,615	88,165	......	762,780	125,132
1939	126,769	538,198	598,972	......	......	598,972	53,751
1938	65,333	456,990	395,534	20	......	395,554	40,829
1937	44,955	589,619	569,241	......	......	569,241	48,339
1936	83,758	523,166	561,969	......	......	561,969	78,626
1935	118,005	431,499	465,687	59	......	465,746	51,186

American Zinc Institute Inc.

*Estimated.

U.S. Lead

Refiners' Stocks, Production, Shipments

Net Tons

	Stock at Beginning	Production (Inc. Secondary)	Total Supply	Domestic Shipments
1956*	31,089	604,000	635,089	484,000
Jan.	31,089	51,306	82,395	49,746
Feb.	32,469	49,475	81,944	39,411
Mar.	41,450	54,174	95,624	39,344
Apr.	52,089	52,976	105,065	44,986
May	53,958	47,961	101,919	40,703
June	50,460	47,367	97,827	41,458
July	45,951	48,479	94,430	36,483
Aug.	49,134	48,404	97,538	48,404
Sept.	39,304	53,530	92,834	47,519
Oct.	40,542	54,815	95,357	45,254
1955	92,719	547,153	639,872	531,339
1954	81,152	551,618	632,770	475,552
1953	43,560	533,883	577,443	488,437
1952	25,339	532,778	558,117	492,094
1951	35,619	486,874	522,493	496,184
1950	70,424	571,763	642,187	499,637
1949	38,644	542,676	581,320	355,905
1948	21,328	511,356	532,684	490,630
1947	47,587	541,065	588,652	566,666
1946	44,867	396,688	441,555	393,904
1945	19,536	524,328	543,864	500,003
1944	33,090	538,618	571,708	552,063
1943	34,937	546,673	581,610	548,417
1942	20,185	633,818	654,003	618,947
1941	40,926	634,888	675,814	655,542
1940	58,777	685,480	644,257	603,143
1939	115,902	497,991	613,893	555,074
1938	129,131	408,539	537,570	421,625
1937	171,856	533,215	705,071	575,933
1936	222,306	463,006	685,312	513,361
1935	234,030	421,764	655,794	433,456
1934	203,061	412,298	615,359	379,807

American Bureau of Metal Statistics.

*Estimated.

Mine Production of Zinc

Net Tons

	1956	1955	1954	1953	1952
Jan. ..	41,019	41,205	39,637	53,002	59,323
Feb. ..	42,671	39,389	39,398	49,356	58,948
Mar. ..	48,108	45,216	42,248	51,680	60,904
Apr. ..	44,957	42,886	39,915	51,103	61,211
May ..	47,438	44,273	40,008	47,790	62,663
June ..	45,066	43,477	40,391	46,365	57,068
July ..	43,507	41,817	38,445	42,305	50,642
Aug. ..	45,759	42,323	38,141	40,965	49,482
Sept. ..	42,367	41,787	34,178	39,188	48,748
Oct. ..	.....	41,338	35,511	38,771	53,346
Nov. ..	.....	39,555	38,338	36,460	48,899
Dec. ..	.....	39,615	39,035	37,745	49,789
Mo. Avg.	.....	41,983	38,770	44,561	55,085

U.S. Bureau of Mines.

Mine Production of Lead

Net Tons

	1956	1955	1954	1953	1952
Jan. ..	26,526	27,828	24,946	30,633	34,299
Feb. ..	27,754	27,427	27,624	29,427	34,339
Mar. ..	31,051	31,315	29,531	31,347	33,432
Apr. ..	29,625	28,686	26,900	31,052	34,496
May ..	29,848	28,932	25,404	29,045	33,824
June ..	29,263	28,427	26,253	28,349	31,002
July ..	27,959	25,783	25,364	26,364	29,862
Aug. ..	30,613	26,813	27,066	26,083	30,232
Sept. ..	27,318	26,876	25,001	26,474	30,386
Oct. ..	.....	27,564	25,755	26,652	33,523
Nov. ..	.....	25,975	26,911	24,671	29,160
Dec. ..	.....	27,802	28,230	27,107	29,542
Mo. Avg.	.....	27,786	26,499	28,100	32,513

U.S. Bureau of Mines.

Titanium

Domestic Production—Net Tons

	Sponge		Mill Products
1956*........	9,500	1956*........	4,300
1955........	7,361	1955........	1,950
1954........	5,370	1954........	1,250
1953........	2,241	1953........	1,150
1952........	1,075	1952........	250
1951........	495	1951........	75
1950........	75	1950........	55
1949........	25	1949........	....

*Estimated.

CONSUMPTION OF SLAB ZINC IN U.S.

Net Tons

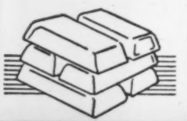
1956	Galvanizing	Brass & Bronze Products	Rolled Zinc	Zinc-Base Alloys	Miscellaneous	Total
Jan.	38,148	13,097	4,442	36,554	4,165	96,406
Feb.	37,702	12,678	3,883	31,274	4,225	89,762
Mar.	38,662	12,889	4,433	31,332	4,466	91,782
Apr.	37,092	12,635	4,010	29,226	4,259	87,222
May	38,064	12,218	3,431	26,003	2,160	81,876
June	37,005	8,351	3,454	21,790	2,215	72,815
July	12,960	5,193	3,187	21,425	3,783	46,548
Aug.	33,840	8,420	4,222	26,814	3,859	77,155
1955	439,697	144,816	50,363	404,790	45,002	1,084,668
1954	398,599	107,293	45,979	286,817	37,442	876,130
1953	377,688	155,608	51,318	236,689	31,480	852,783
1952	375,563	155,311	51,508	236,022	30,885	849,289
1951	400,279	143,292	64,085	296,434	29,881	933,971

CONSUMPTION OF LEAD IN U.S.—1955-1956

Net Tons

	Total	1956						
Metal Products	1955	Jan.	Feb.	Mar.	Apr.	May	June	July
Ammunition	48,816	3,847	3,776	4,074	4,028	4,274	3,972	3,073
Bearing Metals	34,567	2,913	2,415	2,243	2,519	2,353	2,258	1,678
Brass & Bronze	24,043	2,718	2,670	2,598	2,514	2,218	2,052	1,449
Cable Covering	121,165	11,551	10,979	11,376	11,015	12,454	12,001	7,663
Calking Lead	59,406	4,693	4,055	4,305	5,853	4,326	5,820	4,881
Casting Metals	15,141	1,389	1,074	867	907	938	963	813
Collapsible Tubes ...	11,136	1,076	1,137	1,133	1,127	967	624	436
Foil	5,185	292	199	383	263	558	387	276
Pipe, Traps & Bends.	29,757	2,405	2,284	2,229	2,083	2,241	2,196	2,047
Sheet Lead	30,466	2,949	2,671	2,558	2,386	2,553	2,594	2,420
Solder	88,749	6,816	5,881	5,875	6,319	6,338	5,529	5,044
Storage Batteries:								
Antimonial Lead ..	195,787	17,101	15,489	14,745	13,923	15,419	14,828	13,767
Oxides	184,246	16,678	14,122	13,545	13,399	14,586	14,195	12,209
Terne Metal	2,382	130	144	70	176	83	101	106
Type Metal	26,507	1,696	1,845	1,935	1,750	1,834	2,005	1,678
Total Metal Products ..	875,353	76,254	68,741	67,936	68,262	71,142	69,525	57,540
Pigments	128,121	10,576	9,967	10,057	9,428	9,826	9,516	7,731
Chemicals	170,625	16,736	15,987	15,342	15,291	17,031	16,344	18,218
Miscellaneous Uses	35,231	3,277	2,303	2,243	2,467	2,225	2,171	1,425
Total Consumed	1,209,330	106,843	96,998	95,578	95,448	100,224	97,556	84,914

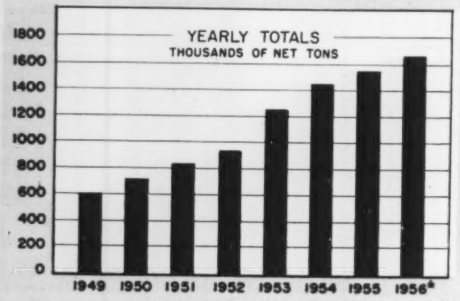
U.S. Bureau of Mines.



Nonferrous Metals

METALWORKING FACTS AND FIGURES

PRIMARY ALUMINUM PRODUCTION



1950-1956 By Months—Net Tons

	1956	1955	1954	1953	1952	1951	1950
Jan.	140,394	128,203	116,247	89,895	76,934	67,954	52,023
Feb.	132,763	116,236	110,483	92,649	72,374	62,740	50,443
Mar.	145,895	130,272	122,339	104,460	77,069	70,022	58,747
Apr.	144,726	126,394	120,434	102,071	76,880	67,701	58,024
May	150,800	131,128	125,138	105,477	80,803	67,721	61,929
June	145,726	127,634	120,758	104,152	77,476	67,453	60,400
July	151,624	132,669	126,162	109,285	78,368	72,698	63,518
Aug.	92,406	133,551	125,296	110,545	85,175	73,815	63,006
Sept.	132,316	130,606	120,332	109,333	76,882	69,429	59,449
Oct.	149,127	134,655	125,089	108,219	77,312	72,647	62,915
Nov.	......	133,689	121,252	105,637	74,639	72,274	62,276
Dec.	......	140,148	127,056	110,291	83,409	72,454	65,897
Total ...	1,676,000*	1,565,785	1,460,586	1,252,014	937,321	836,908	718,627

Yearly totals reflect adjustments and in some instances vary slightly from the sums of monthly figures. *Estimated. U.S. Bureau of Mines.

Secondary Aluminum Production

Net Tons

	From New Scrap	From Old Scrap	Total	As Metal	As Alloys†
1955.........	259,622	76,382	335,994	9,023	326,971
1954.........	232,052	59,989	292,041	5,752	286,289
1953.........	289,626	78,940	368,566	5,203	363,363
1952.........	233,258	71,264	304,522	4,897	299,625
1951.........	216,017	76,591	292,608	5,341	287,267
1950.........	167,308	76,358	243,666	2,140	241,526
1949.........	136,166	44,596	180,762	343	180,419
1948.........	191,129	95,648	286,777	2,384	284,393
1947.........	180,990	163,847	344,837	5,105	339,732
1946.........	187,538	90,535	278,073	2,075	275,998
1945.........	271,076	27,311	298,387	2,145	296,242

†Also includes chemical compounds.
U.S. Bureau of Mines.

Bauxite Production and Imports

Gross Tons—Quarterly figures are preliminary and their sums differ slightly from final annual totals.

	—Mine Production (dried equiv.)—			Imports as Shipped	Total New Supply
	Arkansas	Ala., Ga., Va.	Total		
1956					
1st Qtr.	474,156	15,430	489,586	1,440,769	1,930,355
2nd Qtr.	454,509	14,903	469,412	1,503,846	1,973,258
1955	1,745,684	72,354	1,818,038	5,221,008	7,039,046
1st Qtr.	475,280	18,888	494,168	1,212,548	1,706,716
2nd Qtr.	465,157	16,414	481,571	1,217,442	1,699,013
3rd Qtr.	385,307	24,557	409,864	1,383,130	1,792,994
4th Qtr.	419,940	12,495	432,435	1,407,888	1 840,323
1954	1,955,204	50,723	2,005,927	5,258,530	7,264,457
1st Qtr.	391,305	10,752	402,057	1,350,225	1,752,282
2nd Qtr.	357,216	13,292	370,508	1,319,493	1,690,001
3rd Qtr.	675,137	13,944	689,081	1,303,563	1,992,644
4th Qtr.	531,546	12,735	544,281	1,318,581	1,862,862
1953	1,529,976	49,763	1,579,739	4,388,623	5,968,362
1952	1,603,883	63,214	1,667,047	3,497,939	5,164,986
1951	1,815,274	33,402	1,848,676	2,819,676	4 668,352
1950	1,307,335	27,192	1,334,527	2,516,247	3,850,774
1949	1,094,924	53,868	1,148,792	2,688,164	3,836,956
1948	1,395,341	61,807	1,457,148	2,488,915	3,946,063
1947	1,153,563	48,492	1,202,055	1,821,580	3,023,635
1946	1,019,118	53,707	1,072,825	852 005	1,924,830
1945	910,049	70,960	981,009	739,581	1,720,590

U.S. Bureau of Mines.

Aluminum Wrought Products

Producers' Shipments, Thousands of Pounds

Period		Total	Plate, Sheet, and Strip	Rolled Structural Shapes, Rod, Bar, Wire	Extruded Shapes, Tube Blooms, and Tubing	Powder, Flake, and Paste; Forgings†
1956*	.....	2,900,000	1,580,000	430,000	780,000	110,000
Jan.	....	252,399	142,196	34,008	67,978	8,217
Feb.	....	240,999	134,077	33,727	65,261	7,934
Mar.	....	279,119	156,002	38,272	75,800	9,045
Apr.	....	260,610	143,859	37,971	69,639	9,141
May	....	264,378	147,613	39,900	68,106	8,759
June	....	240,415	132,510	33,438	65,600	8,867
July	....	247,895	139,571	35,346	64,249	8,729
Aug.	....	217,799	104,347	39,643	64,335	9,474
Sept.	....	217,442	117,074	32,231	59,407	8,730
1955	......	2,791,791	1,542,723	367,951	775,092	106,025
Jan.	....	205,136	114,299	27,967	53,516	9,354
Feb.	....	203,585	112,003	26,559	55,080	9,943
Mar.	....	232,767	128,432	30,972	63,482	9,881
Apr.	....	226,208	123,293	29,835	64,353	8,727
May	....	232,656	125,176	30,979	67,908	8,593
June	....	254,123	136,420	35,306	73,214	9,183
July	....	209,096	113,305	27,070	61,792	6,929
Aug.	....	248,457	141,400	32,413	66,315	8,329
Sept.	....	241,847	134,540	32,973	65,119	9,215
Oct.	....	248,806	138,328	30 554	71,456	8,468
Nov.	....	245,526	137,109	31,656	67,798	8,963
Dec.	....	243,584	138,418	31,667	65,059	8,440
1954	......	2,086,562	1,165,076	361,281	513,300	46,905
1953	......	2,286,865	1,368,165	422,046	451,922	44,732
1952	......	1,924,750	1,085,699	443,546	347,542	47,963

U.S. Bureau of the Census. †Forgings included for 1955 and 1956. *Estimated.

Antimony Imports

Net Tons

Year	—Antimony Ore— Gross Weight	Sb Content	Needle or Liquidated Sb	Antimony Metal	Type Metal & Antimonial Lead†	Antimony Oxide
1955...	16,209	7,470	46	3,671	(N.A.)	2,210
1954...	12,870	4,722	33	2,825	4,088	1,476
1953...	17,242	7,778	15	2,627	1,350	1,296
1952...	18,246	7,945	34	3,389	1,494	1,766
1951...	26,320	11,507	8	2,231	465	2,039
1950...	22,307	9,746	19	4,632	1,936	1,160

U.S. Bureau of Mines. (N.A.)—Not available. †Estimated Sb content.

Magnesium Wrought Products

Shipments—Thousands of Pounds

	1956	1955	1954	1953	1952	1951
Jan.	2,118	1,776	972	1,313	1,646	1,522
Feb.	1,902	1,648	1,058	1,454	1,759	1,489
Mar.	2,352	1,947	1,290	1,601	1,723	1,889
Apr.	2,280	1,756	892	1,708	1,756	1,531
May	2,462	1,836	1,128	1,699	1,786	1,716
June	2,302	1,678	1,312	1,192	1,427	1,643
July	2,002	1,437	1,032	1,589	1,390	1,391
Aug.	2,524	1,742	1,111	1,433	1,438	1,497
Sept.	1,988	2,158	1,183	1,254	1,299	1,461
Oct.	....	1,666	1,002	1,409	1,408	1,773
Nov.	....	1,954	1,243	1,314	1,177	1,645
Dec.	....	1,576	1,673	919	1,440	1,533
Total	....	21,174	13,743	16,885	18,249	19,090

U.S. Bureau of Mines.

Antimony Production

Domestic mine production of ores and concentrates, Net Tons

Year	Gross Weight	—Antimony Content— Quantity	Average Per Cent
1955.....	3,700	633	17.0
1954.....	4,685	766	16.4
1953.....	2,161	372	17.2
1952.....	4,854	2,160	44.5
1951.....	9,401	3,472	37.0
1950.....	6,888	2,497	36.3

U.S. Bureau of Mines.

Antimony Consumption

Industrial use of primary antimony—Net Tons

PRODUCTS	1955	1954	1953	1952
Ammunition	5	5	3	3
Antimonial Lead & Battery Metal...	2,519	3,114	5,300	4,449
Bearing Metal and Bearings	831	816	1,000	1,119
Cable Covering ...	146	156	60	43
Castings	67	70	80	80
Collapsible Tubes and Foil	24	47	60	32
Sheet and Pipe ...	157	238	170	70
Solder	131	148	200	145
Type Metal	598	613	700	624
Other Metal	161	118	127	61
Nonmetal products	7,833	6,855	6,600	8,362
Total	12,472	12,180	14,300	14,988

U.S. Bureau of Mines.

Nonferrous Metals

METALWORKING FACTS AND FIGURES

U.S. Tin Imports

Ore (tin content) and Metal (bars, blocks, pigs, etc.) in Gross Tons

	Ore	Metal
1956		
Jan.	2,416	5,224
Feb.	2,746	5,421
Mar.	1,761	4,679
Apr.	1,890	4,338
May	1,053	4,801
June	679	4,482
July	1,182	4,577
Aug.	918	5,367
1955		
Jan.	1,857	4,143
Feb.	1,312	6,385
Mar.	1,769	6,026
Apr.	2,437	3,918
May	1,861	5,454
June	1,163	5,615
July	2,116	5,449
Aug.	2,180	5,520
Sept.	819	5,924
Oct.	1,443	5,975
Nov.	1,966	5,010
Dec	1,163	5,298
MONTHLY AVERAGES		
1955	1,675	5,393
1954	1,845	5,470
1953	2,998	6,212
1952	2,208	6,704
1951	2,469	2,315
1950	2,169	6,910
1949	3,193	5,019
1948	3,124	4,060
1947	2,364	2,075
1946	3,178	1,293

International Tin Study Group.

U.S. Silver Output

(Thousands of ounces; commercial bars, 0.999 fine, and other refined forms)

	From Domestic Ore†	From Foreign Ore	Total
1956*	37,500	40,000	77,500
Jan.	3,249	4,159	7,408
Feb.	3,615	4,033	7,648
Mar.	3,790	3,550	7,340
Apr.	2,898	3,191	6,089
May	2,905	3,709	6,614
June	2,501	2,248	4,749
July	3,828	2,838	6,666
Aug.	3,035	3,818	6,853
Sept.	2,828	3,002	5,830
1955	33,101	32,780	65,881
Jan.	3,416	3,125	6,541
Feb.	2,753	2,851	5,604
Mar.	3,560	2,780	6,340
Apr.	3,068	2,896	5,964
May	3,075	2,224	5,299
June	3,089	3,134	6,223
July	596	930	1,526
Aug.	2,005	1,669	3,674
Sept.	2,840	2,855	5,695
Oct.	2,432	3,889	6,321
Nov.	3,087	2,775	5,862
Dec.	3,180	3,652	6,832
1954	38,059	39,422	77,481
1953	34,697	37,764	72,461
1952	40,245	36,653	76,898
1951	39,967	33,837	73,804
1950	42,068	37,656	79,724
1949	34,559	28,226	62,785

†Includes purchases of crude silver by the United States Mint. *Estimated. American Bureau of Metal Statistics.

U.S. Tin Consumption

Gross Tons

	Consumption			
1956	Primary	Secondary	Total	Stocks
Jan.	5,330	2,805	8,135	31,685
Feb.	5,250	2,865	8,115	28,993
Mar.	5,405	2,895	8,300	28,851
Apr.	5,380	2,585	7,965	25,787
May	5,230	2,385	7,615	23,110
June	5,045	2,370	7,415	22,162
July	2,455	1,960	4,415	24,995
Aug.	4,915	2,475	7,390	23,459
Sept.	5,305	2,105	7,410	26,150
1955	59,828	30,655	90,483	32,972
1954	54,427	28,464	82,891	29,552
1953	53,959	31,681	85,640	51,546
1952	45,323	27,950	73,273	46,625
1951	56,884	31,285	88,169	31,532
1950	71,191	33,273	104,464	63,486
1949	47,163	25,243	72,406	59,813
1948	59,863	30,925	90,788	63,517
1947	59,166	28,934	88,100	68,728
1946	54,627	26,316	80,943	60,585
1945	55,642	27,941	83,583	71,408
1944	59,156	30,813	89,969	89,914

International Tin Study Group; U.S. Bureau of Mines.

Nickel Production

Net Tons

	Canada	Other Countries	Estimated Total
1956* ...	177,000	118,500	295,500
1955† ...	175,000	97,000	272,000
1954	161,300	81,700	243,000
1953	143,700	80,300	224,000
1952	140,560	64,400	205,000
1951	137,900	46,100	184,000
1950	123,660	38,340	162,000
1949	128,690	32,310	161,000
1948	131,740	34,660	166,400
1947	118,621	35,679	154,300
1946	96,062	42,538	138,600
1945	122,565	37,435	160,000
1944	137,299	35,701	173,000
1943	144,009	40,091	184,100
1942	142,606	31,594	174,200
1941	141,129	37,471	178,600
1940	122,779	31,521	154,300
1939	113,053	21,447	134,500

*Estimated. †Preliminary. U.S. Bureau of Mines; Dominion Bureau of Statistics; STEEL.

Tungsten

U.S. Mines—Pounds

1956	Production	Shipments	Industry Stocks
Jan.	1,234,000	1,280,000	3,894,000
Feb.	1,115,000	1,258,000	3,541,000
Mar.	1,506,000	1,386,000	3,086,000
Apr.	1,471,000	1,506,000	3,167,000
May	1,405,000	1,462,000	3,083,000
June	1,204,000	693,000	3,553,000
July	865,000	385,000	4,082,000
1955	15,669,000	15,551,000	4,131,000
1954	13,166,000	13,030,000	4,275,000
1953	9,259,000	9,128,000	4,698,000
1952	7,233,000	7,244,000	3,024,000
1951	5,913,000	5,972,000	4,272,000

U.S. Bureau of Mines.

U.S. Tin Smelter Output

Gross Tons

	1956	1955	1954	1953	1952
Jan. ...	1,754	2,402	2,750	4,000	1,802
Feb. ...	1,704	2,505	3,009	3,400	1,800
Mar. ...	1,802	2,353	3,559	3,850	1,800
Apr. ...	1,803	2,103	3,006	3,750	1,800
May ...	2,001	1,604	2,054	3,100	1,800
June ...	953	851	1,205	3,000	0
July ...	0	952	0	3,000	0
Aug. ...	1,453	1,749	2,002	2,600	0
Sept. ...	1,349	1,751	2,404	2,700	2,450
Oct. ...	....	1,803	2,404	2,751	3,364
Nov. ...	....	1,803	2,205	2,750	4,020
Dec. ...	....	2,453	2,404	2,750	3,705
Total ..	14,500*	22,329	27,002	37,562	22,592

*Estimated. U.S. Bureau of Foreign & Domestic Commerce.

World Tin

Gross Tons

	Production	Consumption	Stocks
1956*	[illegible],000	156,000	63,000
Jan.	16,800	13,400	70,500
Feb.	11,900	13,400	66,800
Mar.	15,900	13,900	65,900
Apr.	14,200	13,000	64,200
May	16,200	13,700	62,600
June	14,200	13,100	62,000
July	12,900	10,700	63,000
Aug.	13,500	12,500	62,500
1955	179,000	152,500	71,900
1954	184,500	137,600	72,800
1953	181,000	131,500	95,000
1952	168,500	130,500	100,400
1951	168,000	140,000	93,000
1950	174,000	153,000	118,200
1949	168,000	114,500	130,800
1948	157,500	130,000	133,100
1947	124,500	125,000	135,200
1946	90,500	113,000	153,000

*Estimated.
International Tin Study Group. Figures are partly estimated and include substantial revisions from previously reported totals.

Molybdenum Products

Comprises ferromolybdenum, molybdic oxide and molybdenum salts and metal

Pounds

1956	Production	Shipments†	Stocks
Jan.	3,591,000	3,615,000	3,220,000
Feb.	3,483,000	3,538,000	3,293,000
Mar.	3,782,000	3,988,000	3,194,000
Apr.	3,550,000	3,582,000	3,293,000
May	3,746,000	3,950,000	3,192,000
June	3,495,000	3,590,000	3,229,000
July	2,437,000	1,801,000	3,966,000
Aug.	2,888,000	3,298,000	3,641,000
1955	37,774,000	38,606,000	3,156,000
1954	24,328,000	25,357,000	3,430,000
1953	30,283,000	30,701,000	3,894,000
1952	32,383,000	32,054,000	3,373,000
1951	32,775,000	31,232,700	3,037,200

†Including exports.
U.S. Bureau of Mines.

Manganese

(Supplies for United States consumption, net tons)

	Domestic Mine Shipments	General Imports		Exports		Net Supply
		Ore	Ferro-manganese†	Ore	Ferro-manganese†	
1956*	300,500	2,100,000	300,000	6,300	4,200	2,690,000
Jan.	22,200	214,818	47,106	500	400	283,000
Feb.	21,800	157,994	28,032	500	400	207,000
Mar.	21,100	190,793	73,760	500	400	285,000
Apr.	30,000	188,223	30,028	500	400	247,000
May	32,000	123,968	52,082	500	400	207,000
June	26,500	236,812	43,418	500	400	306,000
July	30,000	181,905	25,366	435	292	237,000
Aug.	30,000	229,917	64,398	685	296	323,000
1955	286,700	2,088,420	242,658	6,279	4,488	2,609,011
1954	206,128	2,166,144	116,088	6,112	4,348	2,477,900
1953	157,536	3,500,986	252,012	6,894	2,936	3,900,704
1952	115,379	2,668,780	126,502	9,748	2,906	2,898,007

†Expressed in terms of ore. *Estimated. U.S. Bureau of Mines.

Molybdenum Concentrates

Pounds

1956	Production	Shipments†	Consumption	Stocks
Jan.	5,087,000	4,645,000	3,707,000	3,288,000
Feb.	4,905,000	4,927,000	3,624,000	3,370,000
Mar.	5,208,000	5,519,000	3,981,000	3,132,000
Apr.	4,903,000	4,453,000	3,636,000	3,570,000
May	5,108,000	5,272,000	3,898,000	3,407,000
June	4,664,000	4,919,000	3,689,000	3,210,000
July	3,887,000	3,835,000	2,524,000	3,597,000
Aug.	4,936,000	4,162,000	2,973,000	4,303,000
1955	61,781,000	64,467,000	38,799,000	2,730,000
1954	58,668,000	64,021,000	24,710,000	5,317,000
1953	57,243,000	53,823,000	31,193,000	11,326,000
1952	43,259,000	42,717,000	32,715,000	6,856,000

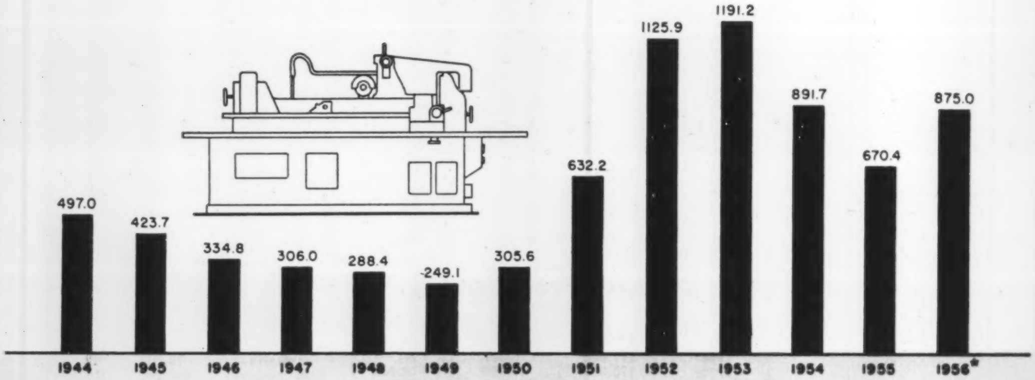
†Including exports, plus concentrates converted to oxide at Miami, Ariz., and Langeloth, Pa.
U.S. Bureau of Mines.

Machine Tools

METALWORKING FACTS AND FIGURES

YEARLY SHIPMENTS

Millions of Dollars



MACHINE TOOLS (Metal Cutting Types Only)

NET NEW ORDERS† (Thousands)

	1956			1955		
	Domestic	Foreign	Total	Domestic	Foreign	Total
Jan.	$96,700	$12,850	$109,550	$51,050	$6,600	$57,650
Feb.	72,350	8,950	81,300	52,050	5,950	58,000
Mar.	80,050	9,450	89,500	53,400	7,250	60,650
Apr.	74,000	5 300	79,300	44,750	5,500	50,250
May	79,450	7,650	87,100	64,250	4,450	68,700
June	55,650	6 200	61,850	68,350	6,200	74,550
July	55,250	6,650	61,900	56,800	5,400	62,200
Aug.	78,250	9,250	87,500	54,350	7,700	62,050
Sept.	68,800	9,650	78,450	53,400	4 950	58,350
Oct.	57,400	8,600	66,000	92,700	6,450	99,150
Nov.	......	.....	......	117,750	6,500	124,250
Dec.	......	.....	......	137,400	13,900	151,300
10 mo. Totals	$717,900	$84,550	$802,450			
Yearly Totals				$846,250	$80,850	$927,100

YEARLY TOTALS

	Domestic	Foreign	Total
1954	$458,150	$56,300	$514,450
1953	692,250	55,800	748,050
1952	748,950	53,600	802,550
1951	1,364,450	163,500	1,527,950
1950	596,500	115,950	712,450
1949	169,600	63,500	233 100
1948	217,950	43,000	260,950
1947	186,500	53,550	240,050
1946	222,750	88,350	311,100
1945	....	.....	353,300

†Gross orders minus cancellations.

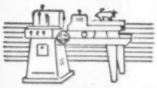
SHIPMENTS (Thousands)

	1956			1955		
	Domestic	Foreign	Total	Domestic	Foreign	Total
Jan.	$49,400	$5,200	$54,600	$43,950	$5,550	$49,500
Feb.	58,700	5,900	64,600	43,950	5,800	49,750
Mar.	67,850	6,300	74,150	53,900	6 000	59,900
Apr.	65,000	6,800	71,800	48,650	4,600	53,250
May	70,500	6,300	76,800	46,550	6,950	53,500
June	69,550	6,700	76,250	52,950	5,850	58,800
July	60,700	4,450	65,150	40,250	4,950	45,200
Aug.	69,000	6,100	75,100	44,000	4,650	48,650
Sept.	65,400	5,700	72,100	51,100	6,700	57,800
Oct.	79,800	9,850	89,650	53,600	6,800	60,400
Nov.	......	.....	......	56,700	6,650	63,350
Dec.	......	.....	......	64,400	5,900	70,300
10 mo. Totals	$655,900	$63,300	$719,200			
Yearly Totals				$600,000	$70,400	$670,400

National Machine Tool Builders' Association. *Estimated.

YEARLY TOTALS

	Domestic	Foreign	Total
1954	$813,250	$78,500	$891,750
1953	1,078,050	113 150	1,191,200
1952	1,003,200	122,700	1,125,900
1951	569,000	63,250	632,250
1950	245,950	59,600	305,550
1949	186,850	62,300	249,150
1948	237,700	50,750	288,450
1947	224,600	81,400	306,000
1946	247,100	87,700	334,800
1945	....	.....	423,700



Machine Tools

METALWORKING FACTS AND FIGURES

METALWORKING MACHINERY (Forming and Shaping Types)

VALUE OF SHIPMENTS (thousands)

		Bending, Forming Machines	Hydraul., Pneumatic Presses	Mechanical-Power Driven Presses	Manual Presses	Punching, Shearing Machines	Forging Machines, Hammers	Wire, Met. Ribbon Form. Machines	Riveting Machines	Misc. Forming, Cutting Machines
1956										
1st	Qtr.	$6,528	$5,833	$40,514	$118	$6,046	$2,258	$539	$872	$2,413
2nd	Qtr.	7,458	6,003	51,095	159	6,579	2,943	976	1,020	1,829
3rd	Qtr.	....	....	.....	....	....	....	....	....	....
1955	....	$23,518	$33,116	$108,853	$320	$18,333	$9,583	$3,011	$3,106	$7,194
1954	....	21,365	40,719	142,766	754	16,086	14,578	2,513	3,268	9,300

VALUE OF NEW ORDERS (thousands)

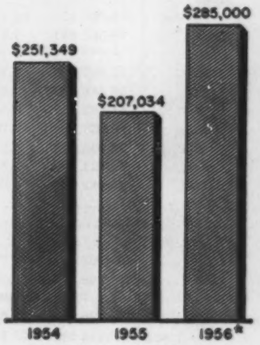
		Bending, Forming Machines	Hydraul., Pneumatic Presses	Mechanical-Power Driven Presses	Manual Presses	Punching, Shearing Machines	Forging Machines, Hammers	Wire, Met. Ribbon Form. Machines	Riveting Machines	Misc. Forming, Cutting Machines
1956										
1st	Qtr.	$7,278	$8,892	$42,860	$215	$7,426	$4,863	$546	$839	$2,333
2nd	Qtr.	5,899	9,502	27,021	100	4,902	2,812	1,002	759	3,419
3rd	Qtr.	....	....	.....	....	....	....	....	....	....
1955	....	$28,489	$27,967	$268,712	$637	$22,730	$12,235	$4,094	$3,188	$10,055
1954	....	18,463	25,386	83,742	330	13,682	9,561	1,813	2,802	9,067

U.S. Bureau of the Census.

*Estimated.

FACTORY SHIPMENTS

(Value in thousands)



PRODUCERS' SHIPMENTS OF MACHINE TOOLS

CLASSES OF MACHINE TOOLS	1956† Dollar Value and No. Units	1955 Dollar Value and No. Units	1954 Dollar Value and No. Units	1953 Dollar Value and No. Units	1952 Dollar Value and No. Units	1951 Dollar Value and No. Units
Boring Machines	$55,640,000 n.a.	$86,179,000 n.a.	$113,606,000 n.a.	$163,648,000 4,650 Units	$152,341,000 4,374 Units	$75,068,000 2,518 Units
Broaching Machines	7,982,000 n.a.	16,510,000 n.a.	17,253,000 n.a.	21,874,000 799 Units	22,678,000 1,105 Units	11,975,000 681 Units
Drilling Machines	45,153,000 n.a.	89,633,000 n.a.	85,057,000 n.a.	114,258,000 n.a.	108,948,000 30,492 Units	70,916,000 19,257 Units
Gear-cutting and Finishing Machines	30,631,000 n.a.	42,249,000 n.a.	46,711,000 n.a.	44,891,000 2,546 Units	47,462,000 2,725 Units	38,336,000 2,452 Units
Grinding and Polishing Machines (except gear-tooth grinding, honing, lapping, polishing and buffing machines)	62,868,000 n.a.	98,043,000 n.a.	154,340,000 n.a.	219,287,000 93,804 Units	210,124,000 89,146 Units	120,833,000 105,090 Units
Lathes	104,853,000 n.a.	155,922,000 n.a.	206,885,000 n.a.	312,165,000 43,077 Units	281,587,000 44,525 Units	170,528,000 43,107 Units
Milling Machines	53,612,000 n.a.	95,821,000 n.a.	119,775,000 n.a.	196,124,000 17,525 Units	159,331,000 16,252 Units	70,257,000 11,287 Units
Planers	3,404,000 n.a.	8,292,000 n.a.	10,978,000 n.a.	10,445,000 164 Units	8,641,000 158 Units	6,638,000 141 Units
Shapers (except gear shapers)	....	....	11,582,000 n.a.	10,932,000 1,495 Units	9,755,000 1,493 Units	6,095,000 1,096 Units
All Other Machine Tools	30,139,000 n.a.	41,145,000 n.a.	124,482,000 n.a.	75,735,000 n.a.	76,013,000 n.a.	58,698,000 n.a.
Total Machine Tools	$394,282,000 n.a.	$633,794,000 n.a.	$890,669,000 n.a.	$1,169,359,000 n.a.	$1,076,880,000 n.a.	$629,344,000 n.a.

n.a.=not available.

U.S. Bureau of the Census. †First Half.

Machinery & Equipment

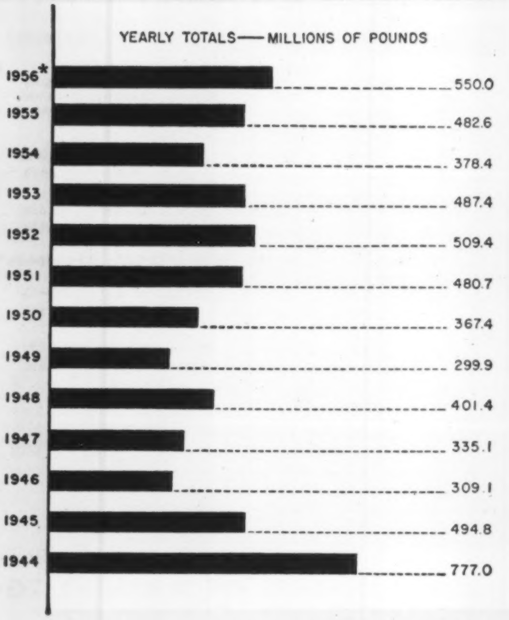
METALWORKING FACTS AND FIGURES

WELDING ELECTRODES

Shipments in Pounds

	Mild Steel	Alloy	Nonferrous	Total
1956				
9 Mos...	341,095,157	62,293,165	1,703,578	405,091,900
Jan. ...	40,396,834	6,933,922	191,452	47,522,208
Feb. ...	38,878,384	7,164,248	218,722	46,261,354
Mar. ...	43,697,834	7,335,413	198,854	51,232,101
Apr. ...	38,288,545	7,736,651	184,859	46,210,055
May ...	41,662,132	6,810,413	202,920	48,675,465
June ...	40,887,902	7,744,795	275,695	48,908,392
July ...	32,383,070	6,330,267	161,334	38,874,671
Aug. ...	24,611,163	5,667,723	145,988	30,424,874
Sept. ...	40,289,293	6,569,733	123,754	46,982,780
Oct. ...	....	....	......	....
Nov. ...	....	....	......	....
Dec. ...	....	....	......	....
1955	409,203,615	71,797,359	1,638,701	482,639,675
1954	324,260,613	52,781,433	1,340,081	378,382,127
1953	409,437,791	76,049,553	1,889,653	487,376,997
1952	425,290,499	82,633,922	1,519,208	509,443,629
1951	413,444,913	65,903,970	1,361,836	480,710,719
1950	322,954,832	42,574,710	1,861,686	367,391,228
1949	273,463,740	24,753,807	1,715,362	299,932,909
1948	369,019,831	30,214,928	2,124,496	401,359,255
1947	307,756,495	25,172,382	2,149,768	335,078,645
1946	284,126,356	24,991,208†	....	309,117,564
1945	435,789,217	59,029,938†	....	494,819,155
1944	707,756,964	69,236,137†	....	776,993,101

†Includes both alloy and nonferrous electrodes. *Estimated.
National Electrical Manufacturers Association.


YEARLY TOTALS—MILLIONS OF POUNDS

Blowers and Fans

Shipments—Thousands of Dollars

Qtrs.	1956	1955	1954	1953
1st	57,931	54,464	54,943	43,591
2nd	71,984	54,990	59,839	55,090
3rd	49,446	58,869	44,177	48,011
4th	......	44,689	38,811	43,037
Total ..	......	213,012	197,770	189,729

U.S. Bureau of the Census.

Air Washers

Shipments—Thousands of Dollars

Qtrs.	1956	1955	1954	1953
1st	508	301	207	220
2nd	576	406	343	218
3rd	637	261	436	317
4th	...	540	385	378
Total ..	...	1,508	1,371	1,133

U.S. Bureau of the Census.

Unit Heaters

Shipments—Thousands of Dollars

Qtrs.	1956	1955	1954	1953
1st	16,408	14,089	13,803	11,817
2nd	18,696	14,538	12,408	12,001
3rd	19,092	15,475	14,172	16,076
4th	.....	20,528	17,856	18,479
Total ..	.....	64,630	58,239	58,373

U.S. Bureau of the Census.

Air Conditioning, Commercial Refrigeration Equipment

Factory Shipments—Number of Units and Value in Thousands of Dollars

	CONDENSING UNITS		COMPRESSORS, COMPRESSOR UNITS		ICE-MAKING MACHINES	
	Number	Value	Number	Value	Number	Value
1954	570,418	63,699	n.a.	127,076	n.a.	11,960
1953	966,136	74,013	2,380,739	121,054	28,228	14,385
1952	654,223	61,439	1,677,300	71,047	26,693	12,838
1951	840,176	75,672	1,051,937	56,669	12,998	8,804
1950	885,913	75,833	954,368	46,977	14,914	8,907
1949	610,341	53,534	604,431	29,929	6,902	4,641
1948	841,609	73,443	459,390	33,493	5.947	5,266
1947	1,039,772	98,296	n.a.	34,586	7,822	3,122

	CENTRIFUGAL REFRIGERATION SYSTEMS		HEAT EXCHANGER EQUIPMENT		SELF-CONTAINED AIR-CONDITIONING UNITS	
	Number	Value	Number	Value	Number	Value
1954	556	19,868	......	128,777	1,436,924	327,369
1953	469	14,970	......	82,602	1,137,293	293,644
1952	363	14,040	......	63,666	438,464	135,579
1951	441	15,300	......	64,935	282,488	93,573
1950	382	12,249	......	61,337	257,263	86,913
1949	285	8,189	......	40,925	123,709	50,584
1948	361	10,351	......	48,552	111,620	49,008
1947	313	7,814	......	63,025	74,976	39,509

U.S. Bureau of the Census.

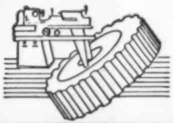
n.a.=not available.

Industrial Control Apparatus

Sales

Qtrs.	1956	1955	1954	1953	1952	1951
1st	$57,554,580	$41,932,375	$45,125,499	$50,057,978	$50,265,710	$38,268,776
2nd	70.428.185	48.017.382	47,066,497	53,213,139	54,427,788	46,397,618
3rd	68,032,797	48.617.670	41,922,808	49,444,714	49,085,727	44,551,726
4th	....	55.597,851	45,138,667	52,641,399	55,129,668	50,715,549
Total	....	$194,165,278	$179,253,471	$205,357,230	$208,908,893	$179,933,669

National Electrical Manufacturers Association.



Machinery & Equipment

METALWORKING FACTS AND FIGURES

Industrial Supplies and Machinery

New Order Index—July, 1948=100

	1956	1955	1954	1953	1952	1951	1950
Jan.	192.7	164.4	139.8	157.4	n.a.	223.4	103.0
Feb.	195.9	175.1	140.5	172.9	n.a.	239.0	108.7
Mar.	206.7	186.9	141.5	188.2	n.a.	220.6	118.1
Apr.	208.6	173.7	131.9	182.1	n.a.	206.7	114.8
May	200.6	191.6	129.4	171.1	n.a.	183.8	118.5
June	197.8	189.1	136.4	160.0	n.a.	n.a.	131.4
July	195.6	163.7	119.4	155.3	140.1	n.a.	143.1
Aug.	196.8	181.2	132.5	139.6	128.8	n.a.	195.3
Sept.	200.7	203.2	148.1	150.6	157.9	n.a.	187.9
Oct.	215.6	190.0	136.3	146.0	158.4	n.a.	185.6
Nov.	....	189.7	146.2	144.8	145.9	n.a.	186.3
Dec.	....	180.0	148.8	136.7	161.1	n.a.	184.8
Mo. Av.	....	182.4	137.6	158.7	....	....	148.1

American Supply & Machinery Manufacturers' Association Inc. n.a.=not available.

Screw Machine Products

Index—1946-1949=100

SHIPMENTS

	1956	1955	1954	1953	1952
Jan.	216	173	174	244	225
Feb.	214	174	161	225	218
Mar.	215	199	171	256	223
Apr.	199	204	158	256	170
May	191	201	146	252	203
June	178	212	143	250	198
July	137	144	109	215	148
Aug.	172	187	140	232	178
Sept.	164	190	143	217	174
Oct.	204	201	154	217	201
Nov.	...	198	148	188	206
Dec.	...	195	158	178	238

Yearly Averages

1955	190	1953	228
1954	150	1952	199
1951	200		

NEW ORDERS

	1956	1955	1954	1953	1952
Jan.	208	186	130	193	158
Feb.	207	191	118	236	179
Mar.	224	239	131	259	171
Apr.	184	198	133	251	201
May	165	201	123	208	203
June	154	191	126	215	213
July	142	183	114	174	164
Aug.	170	220	133	153	181
Sept.	143	208	150	134	184
Oct.	217	216	151	162	214
Nov.	...	200	166	139	205
Dec.	...	203	199	130	250

Yearly Averages

1955	203	1953	188
1954	149	1952	194
1951	244		

National Screw Machine Products Association.

Heat Treating

Billings—Thousands of Dollars

	1956	1955	1954
Jan.	3,082.8	2,181.0	n.a.
Feb.	3,045.2	2,184.5	n.a.
Mar.	3,226.2	2,599.5	n.a.
Apr.	3,172.0	2,579.5	2,227.7
May	3,292.3	2,644.4	1,929.3
June	3,094.5	2,645.1	2,003.7
July	2,762.5	2,180.0	1,744.5
Aug.	3,040.7	2,535.6	1,830.9
Sept.	2,832.9	2,666.8	1,854.1
Oct.	3,442.3	2,897.2	1,891.1
Nov.	.....	2,809.1	1,932.7
Dec.	.....	2,786.6	2,057.5

n.a.=not available.
Metal Treating Institute.

Foundry Equipment Sales

Index of Net Orders Closed for New Equipment
1947-1949=100

	1956	1955	1954
January	195.6	81.0	173.8
February	169.0	90.4	99.9
March	152.7	163.6	82.7
April	135.2	178.6	125.3
May	207.0	145.7	80.8
June	156.7	186.8	86.4
July	110.3	213.4	68.8
August	188.3	134.0	75.6
September	114.7	156.7	68.3
October	....	108.6	147.5
November	....	154.4	61.4
December	....	183.9	113.9
Mo. Avg.	....	149.8	98.3

Foundry Equipment Manufacturers Association.

Industrial Trucks and Tractors

Units Shipped

ELECTRIC TRUCKS (Rider Type)

	1956	1955	1954	1953	1952
Jan.	409	342	523	704	658
Feb.	491	359	467	779	681
Mar.	503	425	473	832	702
Apr.	503	406	366	732	643
May	520	833	445	677	652
June	533	533	445	945	648
July	512	455	413	673	394
Aug.	374	346	357	626	564
Sept.	442	441	357	797	516
Oct.	...	449	348	877	588
Nov.	...	441	359	677	622
Dec.	...	520	394	673	741
Totals	...	5,550	4.947	8,992	7,409

YEARLY TOTALS

1951	6,525	1949	2,600
1950	2,808	1948	3,447

HAND TRUCKS (Motorized)

1956			
Jan.	570	July	682
Feb.	603	Aug.	554
Mar.	671	Sept.	577
Apr.	624	Oct.	...
May	719	Nov.	...
June	702	Dec.	...
1955			6,691

GASOLINE-POWERED TRUCKS AND TRACTORS

1956			
Jan.	1,777	July	2,725
Feb.	1,765	Aug.	2,137
Mar.	2,170	Sept.	2,141
Apr.	2,232	Oct.	....
May	2,254	Nov.	....
June	2,141	Dec.	....
1955			26,843

U.S. Bureau of the Census.

Steel Power Boilers

New Orders

(100 sq ft or more or heating surface)

GRAND TOTAL—ALL TYPES

	Number	Sq ft
1955	6,420	12,782,535
1954	5,496	8,472,185
1953	5,693	9,440,439
1952	5,815	12,707,581
1951	7,452	19,224,576
1950	7,996	16,868,565
1949	5,266	8,379,502
1948	6,507	13,592,766
1947	8,175	14,896,051

STATIONARY BOILERS

	Number	Sq ft
1955	6,323	12,394,955
1954	5,420	8,044,518
1953	5,658	9,243,028
1952	5,556	11,693,401
1951	7,171	17,698,094
1950	7,827	16,468,567
1949	5,190	8,097,503
1948	6,354	12,628,660
1947	8,140	14,786,298

MARINE BOILERS

	Number	Sq ft
1955	97	387,580
1954	76	427,667
1953	35	197,411
1952	259	1,014,180
1951	281	1,526,482
1950	169	399,998
1949	76	281,999
1948	153	964,106
1947	35	109,753

Steam Generating Capacity of Water Tube Boilers

(Thousands of pounds of steam per hour at maximum continuous rating)

	Total	Stationary	Marine
1955	164,120	157,295	6,825
1954	90,669	90,669†	n.a.
1953	82,263	80,634	1,629
1952	129,474	121,374	8,100
1951	209,088	194,082	15,006
1950	187,514	184,831	2,683
1949	67,678	62,745	4,933
1948	119,650	109,762	9,888
1947	129,293	128,096	1,197

†Includes marine boilers.
n.a.=not available.
U.S. Bureau of the Census.

Motors and Generators

New Orders—Thousands of Dollars

Polyphase Induc. Motors, 1-200 hp

Qtrs.	1956	1955	1954
1st	53,266	38,649	35,208
2nd	61,186	44,407	36,817
3rd	.....	49,969	33,448
4th	.....	47,303	34,476
Total	.....	180,328	139,949

DC Generators & Motors, 1-200 hp

Qtrs.	1956	1955	1954
1st	11,509	6,729	9,533
2nd	12,528	10,545	7,[illegible]
3rd	.....	9,950	6,755
4th	.....	12,986	8,130
Total	.....	40,210	32,376

YEARLY TOTALS

Polyphase Induc. Motors, 1-200 hp		DC Generators & Motors, 1-200 hp	
1953	165,875	1953	32,133
1952	152,801	1952	40,483
1951	209,861	1951	43,318
1950	155,308	1950	28,874
1949	76,063	1949	16,900
1948	95,577	1948	22,273
1947	122,043	1947	20,381
1946	142,464	1946	20,942

National Electrical Mfrs. Assn.

Machinery & Equipment

METALWORKING FACTS AND FIGURES

EARTHMOVING and EXCAVATING EQUIPMENT

(Value in thousands of dollars)

Total Manufacturers' Shipments†

1956	
1st Qtr.	$208,877
2nd Qtr.	261,684
3rd Qtr.	200,448
4th Qtr.	....

1955	$724,703
1954	543,352
1953	612,013
1952	623,261
1951	584,278

†Does not include power cranes and shovels.

Wheel-Type Heavy Duty Industrial Tractors

	Units	Value
1956	.....	......
1st Qtr.	1,198	$20,083
2nd Qtr.	1,561	26,951
3rd Qtr.	1,401	25,820
4th Qtr.	....	.....
1955	4,021	$62,658
1st Qtr.	933	13,808
2nd Qtr.	1,236	19,118
3rd Qtr.	1,132	18,402
4th Qtr.	720	11,330
1954	3,019	$46,801
1953	2,944	43,681
1952	4,026	59,847
1951	3,505	55,238

Road Construction and Maintenance Machinery

	Units	Value
1956	....	......
1st Qtr.	....	$45,653
2nd Qtr.	....	56,064
3rd Qtr.	....	47,272
4th Qtr.	....	.....
1955	....	$151,410
1st Qtr.	....	36,855
2nd Qtr.	....	43,989
3rd Qtr.	....	37,066
4th Qtr.	....	33,500
1954	....	$118,970
1953	....	119,674
1952	....	160,068
1951	....	151,779

Construction Machinery for Mounting on Tractors

	Units	Value
1956	....	......
1st Qtr.	....	$25,259
2nd Qtr.	....	31,778
3rd Qtr.	....	27,274
4th Qtr.	....	.....
1955	....	$94,454
1st Qtr.	....	20,169
2nd Qtr.	....	25,371
3rd Qtr.	....	23,429
4th Qtr.	....	25,485
1954	....	$73,877
1953	....	78,440
1952	....	75,829
1951	....	64,816

U.S. Bureau of the Census.

Tracklaying Tractors

	Units	Value
1956	.....	......
1st Qtr.	14,126	$114,603
2nd Qtr.	16,618	141,897
3rd Qtr.	12,502	94,574
4th Qtr.	.....	......
1955	48,891	$359,443
1st Qtr.	11,601	76,500
2nd Qtr.	13,777	92,999
3rd Qtr.	10,236	77,718
4th Qtr.	13,277	112,226
1954	40,374	$267,918
1953	50,597	328,696
1952	48,155	280,841
1951	48,322	263,579

Portable Well and Blast Hole Drills

	Units	Value
1956	....	.....
1st Qtr.	309	$2,059
2nd Qtr.	311	2,327
3rd Qtr.	434	3,140
4th Qtr.	....	.....
1955	1,166	$8,021
1st Qtr.	303	1,885
2nd Qtr.	360	2,290
3rd Qtr.	323	2,230
4th Qtr.	180	1,616
1954	1,176	$8,615
1953	907	8,002
1952	732	6,769
1951	660	5,818

Trucks, Truck Tractors, Trailers and Wagons

OFF-HIGHWAY TYPE

	Units	Value
1956*	....	.....
1st Qtr.	116	$908
2nd Qtr.	192	1,944
3rd Qtr.	158	1,539
4th Qtr.	....	.....
1955*	487	$4,276
1st Qtr.	100	803
2nd Qtr.	147	1,344
3rd Qtr.	130	1,207
4th Qtr.	110	922
1954	1,519	$25,126
1953	1,970	31,184
1952	2,283	32,805
1951	2,611	36,840

*Does not include off highway type trucks (load on back).

Gears

Index of New Orders Placed

1947-1949=100

	1956	1955	1954	1953
Jan.	245.5	140.9	167.4	161.4
Feb.	256.2	148.5	165.1	188.1
Mar.	276.5	172.8	128.6	158.9
Apr.	264.7	179.8	158.2	217.1
May	275.6	205.2	134.3	189.8
June	245.4	193.5	127.4	146.5
July	286.7	201.7	141.3	120.7
Aug.	219.5	217.6	154.7	121.6
Sept.	230.5	246.5	135.1	135.6
Oct.	299.8	227.6	152.3	211.1
Nov.	....	210.4	116.7	144.9
Dec.	....	245.5	182.2	194.0

American Gear Manufacturers Association.

Rigid Steel Conduit and Fittings

Shipments—Thousands of Feet

	1956	1955	1954
January	27,432	24,049	16 133
February	32,877	25,898	17,230
March	34,743	29,762	20,306
April	37,840	30,521	20,770
May	43,495	32,504	21,784
June	54,144	35,210	26 171
July	42,513	53,017	28,544
August	30,344	31,611	28,076
September	28,700	29,682	27,616
October	.....	32,216	27,622
November	.....	29,522	29,645
December	.....	31,052	25,911
Totals	.....	385,144	289,808

National Electrical Manufacturers Association.

Industrial Furnaces†

Net New Orders—Thousands

	1956	1955	1954
January	$10,244	$4,973	$3,643
February	12,163	5,616	3,086
March	7,025	7,345	4,079
April	8,803	7,639	3,496
May	3,620	6,205	5 848
June	25,597*	10,616*	5,663
July	4,140	4,338	1,664
August	6,722	6,273	2,570
September	3,057	8,351	2,534
October	8,741	9,575	3,837
November	....	6,180	3,188
December	....	22,548*	6,847
Total	....	$99,659	$46,455

†Includes electric, fuel-fired and all other types.

*Includes steel mill orders for six months as follows: June, 1955 — $4,804,000; December, 1955 — $11,443,000; June, 1956 — $20,849,000.

Industrial Heating Equipment Association Inc.

Induction and Dielectric Heating Equipment

Net New Orders—Thousands

	1956	1955	1954†
January	$1,221	$1,031	....
February	918	966	....
March	1,221	1,417	....
April	1,456	760	....
May	1,510	1,559	....
June	961	1,365	....
July	996	1,417	$1,580
August	1,030	1,759	830
September	1 650	1,108	439
October	1,468	963	1,014
November	....	1,841	1,266
December	....	2,134	1,500
Total	....	$16,320	$10,387

†Total includes $3,758 for first half.

Industrial Heating Equipment Association Inc.

Machinery & Equipment

METALWORKING FACTS AND FIGURES

Resistance Welding Equipment

1956	Value of Factory Shipments	Order Backlogs at Start of Month
January	n.a.	n.a.
February	n.a.	n.a.
March	n.a.	n.a.
April	$3,513,513	n.a.
May	3,580,512	$21,803,513
June	4,747,082	22,066,749
July	5,691,310	21,389,965
August	6,389,887	19,193,343
September ...	4,216,615	18,013,588
October	3,934,317	16,144,370
November ...	....	14,869,102
December	....	....

n.a.=not available.
Resistance Welder Manufacturers' Association.

Ball Bearings and Parts

(Imports)

1956	lb	Value
1st 9 Mos. ..	440,077	$848,786
1955†	1,169,243	2,346,333
1954†	376,397	576,383
1953	808,641	1,090,100
1952	928,940	1,453,539
1951	843,706	1,541,301
1950	85,027	156,496
1949	12,349	47,979
1948	14,396	55,091
1947	15,973	39,426
1946	48,845	106,953

Roller Bearings and Parts

(Imports)

1956	lb	Value
1st 9 Mos. ..	308,960	$678,662
1955†	475,389	926,816
1954†	278,099	463,077
1953	881,330	1,307,201
1952	899,189	1,289,746
1951	901,351	1,244,019
1950	88,622	117,673
1949	14,464	38,955
1948	59,538	127,680
1947	40,432	67,144
1946	71,325	127,435

†Does not include shipments valued at less than $250.
Foreign Trade Division, U.S. Bureau of the Census.

Typewriters

Factory Shipments

1956	Number	Value (thousands)
January	92,748	$11,791
February	99,500	12,070
March	125,184	14,723
April	106,537	13,156
May	110,031	14,164
June	95,091	13,987
July	86,607	10,235
August	136,490	16,987
September	155,787	17,968
October	......	.....
November	......	.....
December	......	.....

U.S. Bureau of the Census.

Contract Stampings Shipments

1956

Index—1947-1949=100

Jan.	195	May	185	Sept.	155
Feb.	167	June	146	Oct.	...
Mar.	191	July	120	Nov.	...
Apr.	165	Aug.	163	Dec.	...

1955

Jan.	150	May	154	Sept.	140
Feb.	139	June	142	Oct.	120
Mar.	167	July	110	Nov.	139
Apr.	129	Aug.	140	Dec.	157

YEARLY AVERAGES

1956 (9 Mos.) 165 1955 141

Pressed Metal Institute.

ARC WELDING SETS

Units Ordered, Excluding Exports

	Single Operator, Variable Voltage, DC Sets			Transformer Welders	
	Motor Drive	Engine Drive	Generators Only	Industrial Type	Limited Input Type
1956					
Jan. ...	1,888	869	16	1,228	1,259
Feb. ...	2,269	1,089	17	1,271	1,246
Mar. ...	2,219	913	25	1,584	1,454
Apr. ...	1,314	843	26	1,472	1,319
May ...	1,927	1,003	8	1,570	1,142
June ...	2,163	841	17	1,360	980
July ...	1,549	1,246	16	1,197	1,082
Aug. ...	1,816	756	11	1,580	1,193
Sept. ..	1,738	983	10	1,223	1,040
Oct. ...	....	....	..	....	....
Nov. ...	....	....	..	....	....
Dec. ...	....	....	..	....	....
1955	17,102	9,160	260	13,965	14,041
Jan. ...	1,285	632	10	959	1,063
Feb. ...	1,297	556	14	1,314	1,126
Mar. ...	1,618	858	16	1,397	1,448
Apr. ...	1,318	792	27	1,276	1,295
May ...	1,362	841	46	1,127	1,151
June ...	1,636	850	12	1,251	1,085
July ...	1,372	791	17	1,092	956
Aug. ...	1,543	805	19	1,259	1,413
Sept. ...	1,684	838	15	1,265	1,419
Oct. ...	1,158	789	50	983	1,127
Nov. ...	1,362	859	14	1,049	1,092
Dec. ...	1,467	549	20	993	866
1954	12,817	7,450	340	12,220	10,310
1953	16,362	9,673	435	13,009	10,595
1952	18,932†	11,104	227	16,794	18,489
1951	13,048†	10,333	485	15,645	16,954
1950	10,115†	8,207	272	9,652	16,674
1949	7,393†	6,193	256	7,295	12,647
1948	10,927†	10,435	385	8,792	13,690
1947	13,677†	10,882	1,169	9,719	13,034
1946	16,467†	10,622	2,818	21,093	16,949
1945	20,716†	8,776	2,795	21,448	
1944	30,230†	6,023	3,140	15,426	

†Does not include rectifier type.
National Electrical Manufacturers Association.

INTERNAL COMBUSTION ENGINES

Factory Shipments

Gasoline Engines

(Except Automotive, Aircraft, Outboard and Miniature)

			Shipped To Other Firms	
	Total Engines Produced	No. Used In Own Product	Number Engines	Value (thousands)
1954	3,669,505	675,930	2,993,575	$179,323
1953	2,989,175	783,211	2,205,964	171,289
1952	2,945,050	719,436	2,225,614	188,647
1951	3,103,551	931,285	2,172,266	183,877
1950	2,458,274	745,336	1,712,938	129,816
1947	2,140,516	545,184	1,595,332	154,118

Diesel Engines (Except Automotive)

			Shipped To Other Firms	
	Total Engines Produced	No. Used In Own Product	Number Engines	Value (thousands)
1954	104,686	56,047	48,639	$172,271
1953	117,628	59,075	58,553	232,488
1952	120,538	56,660	63,878	184,585
1951	129,203	62,653	66,550	166,377
1950	98,955	56,048	42,907	100,482
1947	100,183	37,125	63,058	156,969

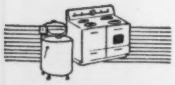
Gas Engines (Except Automotive, Aircraft and Miniature)

			Shipped To Other Firms	
	Total Engines Produced	No. Used In Own Product	Number Engines	Value (thousands)
1954	10,691	4,501	6,190	$25,993
1953	9,615	6,482	3,133	37,615
1952	8,624	4,713	3,911	47,249

Outboard Motors

	Number	Value (thousands)		Number	Value (thousands)
1956	600,000*	n.a.	1952	337,419	$46,129
1955	550,000*	n.a.	1951	291,697	39,456
1954	479,350	$76,039	1950	367,173	41,037
1953	467,584	67,489	1947	584,458	50,038

*Estimated by Outboard Marine Corp.
U.S. Bureau of the Census.



Appliances

Floor and Wall Furnaces

Factory Shipments

	1956		1955	
	Number of Units	Value, Thousands of Dollars	Number of Units	Value, Thousands of Dollars
Jan. ..	32,523	2,211	38,509	2,272
Feb. ..	29,251	1,946	37,607	2,344
Mar. ..	33,794	2,312	40,531	2,486
Apr. ..	31,522	2,033	40,391	2,569
May ..	34,116	2,283	39,021	2,567
June ..	34,847	2,227	37,440	2,401
July ..	39,191	2,560	38,082	2,478
Aug. ..	47,675	3,288	56,935	3,853
Sept. ..	53,876	3,860	64,835	4,444
Oct. ..	.....	....	71,824	4,985
Nov. ..	.....	....	53,920	3,465
Dec. ..	.....	....	37,805	2,504
Total.	.....	....	556,900	36,368

YEARLY TOTALS

	Number of Units	Value, Thousands of Dollars
1954	549,894	35,699
1953	551,614	36,198
1952	547,796	34,383

U.S. Bureau of the Census.

Oil Burners

(Units sold separately)

	Residential	Commercial, Industrial	Total
1956			
9 Mos. ..	332,694	26,904	359,598
Jan.	32,213	2,446	34,659
Feb.	28,807	2,695	31,502
Mar.	27,296	2,363	29,659
Apr.	31,257	2,766	34,023
May	31,681	3,011	34,692
June	39,255	3,548	42,803
July	35,758	2,625	38,383
Aug.	50,411	3,734	54,145
Sept.	56,016	3,716	59,732
Oct.	.....	....	.....
Nov.	.....	....	.....
Dec.	.....	....	.....
1955	536,234	36,849	573,083
Jan.	38,842	2,248	41,090
Feb.	38,797	2,035	40,832
Mar.	38,851	2,391	41,242
Apr.	38,718	2,207	40,925
May	39,695	2,887	42,582
June	40,919	3,205	44,124
July	44,420	2,664	47,084
Aug.	59,715	4,159	63,874
Sept.	68,133	4,168	72,301
Oct.	62,333	4,160	66,493
Nov.	39,145	3,810	42,955
Dec.	26,666	2,915	29,581

YEARLY TOTALS

	Residential	Commercial, Industrial	Total
1954	494,259	34,321	528,580
1953	540,774	38,922	579,696
1952	504,557	34,436	538,993
1951	465,711	38,568	504,279

U.S. Bureau of the Census.

Oil Cooking Stoves

(Kerosene, Gasoline and Fuel Oil)

Shipments—Units

	1956	1955	1954	1953
Jan.	8,835	9,123	8,946	8,347
Feb.	9,473	8,343	8,437	10,081
Mar.	8,016	8,902	9,422	10,429
Apr.	8,733	9,920	8,313	10,492
May	7,283	7,840	9,229	10,726
June	6,206	7,892	8,932	7,146
July	4,815	5,427	6,582	6,180
Aug.	11,839	12,471	9,676	9,231
Sept.	7,673	12,182	10,184	8,363
Oct.	.....	12,039	11,652	10,361
Nov.	.....	8,268	9,127	10,151
Dec.	.....	8,062	8,773	9,972

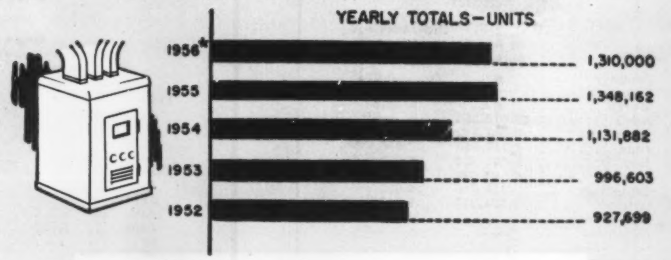
YEARLY TOTALS

1955..110,469	1953..111,479	1951..132,833
1954..109,273	1952..119,928	1950..190,776

U.S. Bureau of the Census.

WARM AIR FURNACES

(Cast Iron and Steel)



SHIPMENTS

	1956		1955	
	Number of Units	Value, Thousands of Dollars	Number of Units	Value, Thousands of Dollars
Jan.	87,497	16,726	85,476	15,920
Feb.	78,906	14,921	79,537	14,947
Mar. ...	84,882	15,991	87,121	16,405
Apr.	84,992	15,824	91,908	17,310
May	93,590	17,010	99,937	18,414
June	104,167	19,611	117,376	21,742
July	111,614	21,146	107,905	20,329
Aug. ...	159,704	30,926	163,741	31,026
Sept. ...	154,509	30,029	164,154	32,391
Oct.	......	.....	150,331	28,797
Nov.	......	.....	120,948	23,234
Dec.	......	.....	79,728	15,292
Total .	......	.....	1,348,162	255,807

Yearly Totals	Number of Units	Value, in Dollars
1954	1,131,882	218,039,000
1953	996,603	197,275,000
1952	927,699	187,987,000
1951	871,527	180,848,000
1950	1,099,734	205,484,000
1949	719,972	130,548,000

U.S. Bureau of the Census.

*Estimated.

Forced Air Furnaces

Shipments—Number of Units

	Solid Fuel	Oil	Gas	Total
1956				
9 Mos..	10,601	297,878	594,718	903,197
Jan. ..	768	27,544	54,094	82,406
Feb. ..	569	25,177	48,758	74,504
Mar. ..	460	26,053	54,261	80,774
Apr. ..	427	25,069	55,322	80,818
May ..	890	26,294	61,122	88,306
June ..	1,056	30,156	67,857	99,069
July ..	1,483	34,492	69,145	105,120
Aug. ..	2,432	52,207	95,081	149,720
Sept. .	2,516	50,886	89,078	142,480
Oct. ..	......	......	......	......
Nov. ..	......	......	......	......
Dec. ..	......	......	......	......
1955	14,872	449,863	793,410	1,258,145
Jan. ..	733	31,416	48,294	80,443
Feb. ..	735	28,462	45,048	74,245
Mar. ..	763	30,150	51,423	82,336
Apr. ..	606	31,145	55,858	87,609
May ..	726	33,898	59,606	94,230
June ..	828	39,128	70,429	110,385
July ..	1,371	38,458	60,807	100,636
Aug. ..	1,953	56,924	94,026	152,903
Sept. .	2,340	53,180	95,860	151,380
Oct. ..	2,286	47,031	88,650	137,967
Nov. ..	1,785	36,742	73,021	111,548
Dec. ..	746	23,329	50,388	74,463
1954	13.748	413,277	597,017	1,024,042
1953	16.280	403,207	443,510	862,997
1952	21,262	345,433	398,889	765,584

U.S. Bureau of the Census.

Gravity Air-Flow Furnaces

Shipments—Number of Units

	Solid Fuel	Oil	Gas	Total
1956				
9 Mos. .	25,895	3,289	27,480	56,664
Jan. ...	2,088	315	2,688	5,091
Feb. ...	1,895	240	2,267	4,402
Mar. ..	1,615	227	2,266	4,108
Apr. ...	1,864	242	2,068	4,174
May ...	2,364	291	2,629	5,284
June ...	2,473	278	2,347	5,098
July ...	3,399	278	2,817	6,494
Aug. ..	4,687	666	4,631	9,984
Sept. ..	5,510	752	5,767	12,029
Oct. ...	.....	.....	.....	.....
Nov. ...	.....	.....	.....	.....
Dec. ...	.....	.....	.....	.....
1955	39,608	6,172	44,237	90,017
Jan. ...	1,921	483	2,629	5,033
Feb. ...	2,145	455	2,692	5,292
Mar. ...	2,175	360	2,250	4,785
Apr. ...	1,806	339	2,154	4,299
May ...	2,231	386	3,090	5,707
June ...	2,766	529	3,696	6,991
July ...	3,069	444	3,756	7,269
Aug. ...	4,438	868	5,532	10,838
Sept. ..	5,881	925	5,968	12,774
Oct. ...	6,017	629	5,718	12,364
Nov. ...	4,534	460	4,406	9,400
Dec. ...	2,625	294	2,346	5,265
1954	37,258	11,938	58,617	107,840
1953	55,625	17,874	60,107	133,606
1952	79,231	18,033	64,851	162,115
1951	119,368	18,330	68,532	206,230

U.S. Bureau of the Census.

Cast Iron Radiators and Convectors

Shipments in thousands of square feet of radiation

	1956	1955	1954
January	2,018	1,675	2,041
February	2,236	1,970	1,896
March	1,802	2,419	1,732
April	1,900	2,035	2,285
May	1,577	1,732	1,745
June	1.618	2,208	2,208
July	1,959	1,865	1,937
August	2,996	3.615	3.315
September	....	3,326	3,217
October	....	3,115	3,354
November	....	2,779	2,700
December	....	1,773	1,956
Total	....	28,512	28,386

YEARLY TOTALS

1953	31,667	1951	42,512
1952	36,898	1950	48,175

U.S. Bureau of the Census.

Plumbing Fixtures

Shipments—Value in Thousands

VITREOUS CHINA AND GLAZED EARTHENWARE

Qtr.	1956	1955	1954	1953
1st	$38,341	$31,102	$26,078	$22,228
2nd	38,801	34,415	26,062	22,109
3rd	36,805	35,810	27,532	24,069
4th	.....	36,350	30,164	22,641
Total	.....	$137,677	$109,836	$91,047

1952	$85,230	1950	$102,332
1951	108,230	1949	77,159

ALL METAL—EXCLUSIVE OF FITTINGS

Qtr.	1956	1955	1954	1953
1st	$50,862	$55,840	$44,333	$45,706
2nd	51,334	59,758	47,029	48,159
3rd	54,428	60,038	53,285	49,644
4th	.....	49,714	52,057	43,181
Total	.....	$225,350	$196,704	$186,690

1952	$176,136	1950	$212,675
1951	202,530	1949	139,227

CAST IRON

Qtr.	1956	1955	1954	1953
1st	$33.886	$37,517	$30,560	$30,536
2nd	34,180	39,397	29,744	32,767
3rd	35,516	39,403	35,454	33,265
4th	.....	32,200	35,063	28,671
Total	.....	$148,517	$130,821	$125,239

1952	$119.654	1950	$144,527
1951	141,920	1949	97,336

STEEL

Qtr.	1956	1955	1954	1953
1st	$16,736	$18,082	$13,650	$14,957
2nd	16,887	20,140	17,150	15,166
3rd	18,668	20,421	17,688	16,129
4th	.....	17,353	16,883	14,335
Total	.....	$75,996	$65,371	$60,587

1952	$55.586	1950	$65,850
1951	59,404	1949	39,985

ALUMINUM, MONEL & OTHER METAL

Qtr.	1956	1955	1954	1953
1st	$213	$241	$123	$213
2nd	267	221	135	226
3rd	244	214	143	250
4th	...	161	111	175
Total	...	$837	$512	$864

1952	$896	1950	$2,298
1951	1,206	1949	1,906

U.S. Bureau of the Census.

Domestic Heating Stoves

Shipments

	Coal, Wood†	Gas	Oil‡	Total
1956				
9 Mos.	230,437	1,090,899	482,280	1,803,616
Jan.	6,896	57,044	26,815	90,755
Feb.	10,245	58,849	37,199	106,293
Mar.	10,636	76,970	43,628	131,234
Apr.	14,310	71,694	39,576	125,580
May	18,511	99,159	48,497	166,167
June	24,269	132,474	49,894	206,637
July	32,832	183,315	64,470	280,617
Aug.	54,526	215,861	78,258	348,645
Sept.	58,212	195,533	93,943	347,688
Oct.	......	......	......	......
Nov.	......	......	......	......
Dec.	......	......	......	......
1955	311,167	1,469,688	636,430	2,417,285
Jan.	4,824	41,646	28,534	75,004
Feb.	4,422	38,228	48,247	90,897
Mar.	7,710	50,350	47,297	105,357
Apr.	8,624	50,311	39,372	98,307
May	10,624	74,605	37,493	122,722
June	15,589	116,854	53,758	186,201
July	26,304	142,723	64,171	233,198
Aug.	45,107	185,481	80,576	311,164
Sept.	56.196	214,388	83,236	353,820
Oct.	65,947	251,629	81,878	399,454
Nov.	47,447	212,565	43,534	303,546
Dec.	18,373	90,908	28,334	137,615

YEARLY TOTALS

1954	271,197	1,387,517	661,125	2,319 839
1953	331,601	1,674,161	972,919	2,978,681
1952	449,099	1,786,360	1,113.600	3,349.059

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† Excludes sheet metal airtight type.
‡ Includes kerosene stoves.
U.S. Bureau of the Census.

Electric Lamps (Bulbs)

Manufacturers' Shipments
Value in Thousands of Dollars

	Domestic	Export	Total
1956—9 Mos.	252,809	11,199	264.008
1955	323,172	14,254	337,426
1954	290,618	11,439	302 059
1953	277,529	11,819	289,348
1952	229,899	8,206	238,105
1951	252,465	11,670	264,135
1950	233.860	9,297	243,157
1949	192,638	7,240	199,878

PRODUCTION

Thousands of Lamps

1956—9 Mos.	1,870,062	1952	n.a.
1955	2,484,613	1951	2,341,154
1954	2,246,746	1950	2,084,607
1953	2,247,700	1949	1,832,423

n.a. = not available.
U.S. Bureau of the Census.

Receiving Tubes

(Manufacturers' Sales)

	Number	Value
1956 (9 Mos.)	347,436,000	$279,237,000
January	40,141,000	31,314,000
February	37,754,000	30,756,000
March	42,525,000	34,849,000
April	35,184,000	28,616,000
May	33,015,000	27,145,000
June	39,037,000	32,176,000
July	31,400,000	24,781,000
August	43,948,000	34,507,000
September	44,432,000	35,093,000
October	....	....
November	....	....
December	....	....
1955	479,802,000	$358,110,000
1954	385,089,458	275,998,883

Radio-Electronics-Television Mfrs. Assn.

Television Picture Tubes

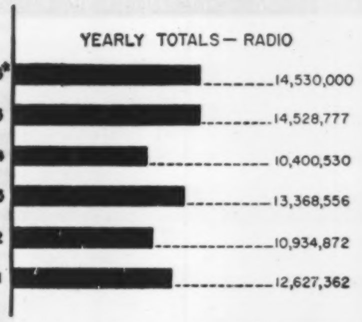
(Manufacturers' Sales)

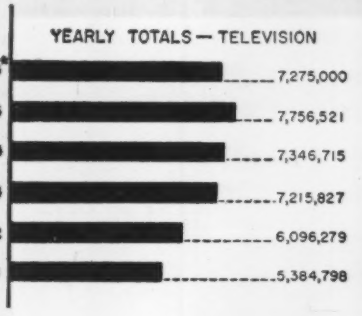
	Number	Value
1956 (9 Mos.)	8,087 352	$146,995,480
January	892,385	17,016,391
February	898,063	17,136,695
March	848,055	15,714,365
April	830,902	15,141,461
May	906,732	16 123,625
June	776,601	13,663,408
July	585,380	10,861,634
August	1,099,605	19,628,837
September	1,249,624	21,709 064
October	....	....
November	....	....
December	....	....
1955	10,874,234	$209,007,518
1954	9,913,504	206,075,994

Radio-Electronics-Television Mfrs. Assn.

RADIO AND TELEVISION RECEIVERS

Number Produced





RADIOS

	Automobile	Other	Total
1956			
9 Mos.	3,060,093	6,475,803	9,535,896
January	519,648	558,976	1,078,624
February	437,611	655,895	1,093,506
March	478,272	827,841	1,360,113
April	299,253	693,729	992,982
May	282,611	777,554	1,060,165
June	296,256	777,519	1,073,775
July	198,565	358,132	566,697
August	198,087	792,758	990,845
September	349,790	769,399	1,319,189
October	......	......	......
November	......	......	......
December	......	......	......

YEARLY TOTALS

	Units	Value (Manufacturers')
1955	14,528,777	$291,157,000
1954	10,400,530	208,000,000
1953	13,368,556	293,573,490
1952	10,934,872	249,847,000
1951	12,627,362	315,936,597
1950	14,589,900	375,000,000

TELEVISION

	1956	1955	1954
January	558,347	654,582	420,571
February	576,282	702,514	426,933
March	680,003	831,156	599,606
April	549,632	583,174	457,608
May	467,913	467,394	396,287
June	553,025	589,973	544,142
July	336,931	344,295	306,985
August	612,927	647,903	633,387
September	894,211	939,515	947,796
October	......	759,735	921,476
November	......	631,654	858,501
December	......	604,626	833,423

YEARLY TOTALS

	Units	Value (Manufacturers')
1955	7,756,521	$1,071,020,000
1954	7,346,715	1,040,466,000
1953	7,215,827	1,170,151,000
1952	6,096,279	1,049,000,000
1951	5,384,798	956,986,300
1950	7,463,800	1,350,000,000

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*Estimated.
Radio-Electronics-Television Mfrs. Assn.

Appliances

Electric Disc Stoves and Hot Plates

(1650 Watts or Less)
Sales Billed—Units

	1956	1955	1954	1953†
Jan.	17,485	23,679	37,545	n.a.
Feb.	24,801	30,214	41,796	n.a.
Mar.	27,087	30,853	27,165	n.a.
Apr.	27,738	22,930	20,807	n.a.
May	28,622	29,018	24,022	n.a.
June	24,151	27,722	22,412	n.a.
July	20,740	31,569	28,136	42,137
Aug.	39,967	42,220	48,891	63,099
Sept.	43,500	48,028	42,719	53,426
Oct.	.....	41,460	33,254	52,093
Nov.	.....	30,884	33,487	41,610
Dec.	.....	29,656	16,885	26,157
Total	.....	388,233	377,119	532,056

†Total includes 253,534 units for first half.
n.a.=not available.
National Electrical Manufacturers Association.

Electric Air Heaters, Portable

Sales Billed—Units

CONVECTOR AND RADIANT

	1956	1955	1954	1953†
Jan.	6,550	2,579	3,905	n.a.
Feb.	6,343	2,114	1,487	n.a.
Mar.	572	939	461	n.a.
Apr.	894	915	209	n.a.
May	401	1,228	1,750	n.a.
June	2,157	1,458	1,285	n.a.
July	7,231	8,257	5,312	10,018
Aug.	21,666	16,940	25,338	23,723
Sept.	27,654	33,718	36,238	41,113
Oct.	.....	25,439	27,236	33,221
Nov.	.....	15,874	19,655	17,172
Dec.	.....	9,048	6,454	4,398
Total	.....	118,509	129,330	146,975

FAN FORCED AND FAN AND HEATER COMBINATION

	1956	1955	1954
Jan.	28,841	16,690	24,705
Feb.	13,737	11,863	11,001
Mar.	6,933	4,113	6,106
Apr.	4,589	4,515	4,688
May	21,967	25,556	16,874
June	32,580	34,799	15,234
July	34,151	53,499	40,057
Aug.	90,703	82,070	105,080
Sept.	175,572	129,677	110,647
Oct.	.....	106,930	92,520
Nov.	.....	107,189	79,419
Dec.	.....	69,889	39,429
Total	.....	646,790	545,760

†Total includes 17,330 units for first half.
n.a.=not available.
National Electrical Manufacturers Association.

Electric Coffee Makers, Pots & Urns

Vacuum (glass & metal) and Percolators
Sales Billed—Units

	1956	1955	1954	1953†
Jan.	242,506	151,449	200,967	n.a.
Feb.	253,876	170,448	221,829	n.a.
Mar.	206,543	265,929	207,866	n.a.
Apr.	206,807	122,218	182,575	n.a.
May	218,349	137,713	185,773	n.a.
June	250,543	170,498	205,540	n.a.
July	222,296	185,046	182,922	227,277
Aug.	411,273	251,419	249,581	322,324
Sept.	449,631	413,961	323,760	388,130
Oct.	......	383,012	378,822	404,945
Nov.	......	339,348	256,348	323,931
Dec.	......	275,382	193,571	246,904
Total.	......	2,866,423	2,789,554	3,258,394

†Total includes 1,344,883 units for first half.
n.a.=not available.
National Electrical Manufacturers Association.

Electric Grills and Waffle Irons

Sales Billed—Units
Sandwich Grills & Griddles, Waffle Irons & Combination Grills & Waffle Irons

	1956	1955	1954
Jan.	38,145	57,126	37,467
Feb.	49,731	55,904	35,716
Mar.	60,213	51,896	34,767
Apr.	24,312	52,073	25,740
May	23,777	28,143	27,488
June	44,294	33,858	41,032
July	70,697	69,914	70,034
Aug.	78,771	76,225	112,640
Sept.	85,618	107,570	114,669
Oct.	.....	86,133	86,089
Nov.	.....	78,330	64,709
Dec.	.....	60,698	49,214
Total	.....	757,870	699,565

National Electrical Manufacturers Association.

Electric Freezers

(Home and Farm)
Sales Billed—Units

	1956	1955	1954	1953
Jan.	51,017	56,672	49,017	85,239
Feb.	54,932	61,000	50,594	83,661
Mar.	55,926	63,631	52,114	111,888
Apr.	62,521	58,473	64,297	89,031
May	54,429	57,618	59,728	70,279
June	61,020	77,527	76,819	62,375
July	68,907	72,706	61,145	66,712
Aug.	61,595	58,445	57,509	59,497
Sept.	51,978	72,987	63,268	58,140
Oct.	.....	57,016	53,330	41,371
Nov.	.....	44,353	40,321	29,800
Dec.	.....	44,026	40,746	36,695
Total	.....	724,454	668,888	794,688

National Electrical Manufacturers Association.

Deep Fat Fryers

Sales Billed—Units

	1956	1955	1954
Jan.	9,535	16,979	29,714
Feb.	10,053	19,302	31,976
Mar.	8,848	12,197	19,146
Apr.	6,155	9,019	23,511
May	4,808	12,544	20,888
June	6,264	11,085	17,616
July	10,632	19,883	22,888
Aug.	9,569	18,684	33,377
Sept.	9,161	36,421	35,199
Oct.	.....	18,154	36,258
Nov.	.....	10,478	30,775
Dec.	.....	—(710)*	24,010
Total	.....	184,036	325,358

*Represents bookkeeping adjustment at year end.
National Electrical Manufacturers Association.

Steel Kitchen Cabinets

(Including steel cabinet sink units)
(Factory Sales)

	Units	Retail Value
1956	3,641,000	$188,395,000
1955	4,046,000	209,328,000
1954	3,372,000	174,440,000
1953	3,441,000	178,000,000
1952	2,970,000	154,000,000
1951	2,871,000	128,850,500
1950	2,969,000	125,848,500

Steel Kitchen Cabinet Manufacturers Assn. Inc.

Electric Toasters

Sales Billed—Units

AUTOMATIC

	1956	1955	1954	1953†
Jan.	120,420	156,967	119,972	n.a.
Feb.	131,940	132,864	115,732	n.a.
Mar.	174,013	126,824	97,883	n.a.
Apr.	138,077	92,281	76,833	n.a.
May	125,595	101,970	81,400	n.a.
June	214,086	185,028	118,171	n.a.
July	281,140	241,794	209,360	206,686
Aug.	272,223	338,797	310,476	250,421
Sept.	279,828	270,346	318,845	290,968
Oct.	......	240,448	306,878	298,394
Nov.	......	288,809	258,171	260,313
Dec.	......	169,189	142,685	201,303
Total.	......	2,345,816	2,156,406	2,304,851

NONAUTOMATIC

	1956	1955	1954	1953‡
Jan.	14,763	14,739	21,889	n.a.
Feb.	14,484	10,411	15,324	n.a.
Mar.	17,738	15,502	12,323	n.a.
Apr.	12,974	14,749	10,391	n.a.
May	11,700	14,034	13,683	n.a.
June	12,934	12,720	18,466	n.a.
July	14,375	12,530	14,495	27,635
Aug.	28,009	21,598	19,935	27,350
Sept.	23,768	17,330	37,110	35,537
Oct.	.....	17,966	37,791	35,289
Nov.	.....	21,929	19,884	23,609
Dec.	.....	20,660	13,371	22,261
Total.	.....	194,168	234,662	300,800

†Total includes 796,766 units for first half.
‡Total includes 129,119 units for first half.
n.a.=not available.
National Electrical Manufacturers Association.

Standard-Size Ironers

Factory Sales—Units

	1956	1955	1954	1953
Jan.	4,963	8,648	9,792	24,395
Feb.	4,516	8,241	8,208	22,588
Mar.	4,809	7,750	6,025	16,066
Apr.	4,753	6,050	8,388	14,080
May	4,222	6,558	7,210	9,323
June	3,607	6,017	5,185	12,529
July	3,570	4,861	5,227	9,626
Aug.	4,857	6,005	5,925	8,067
Sept.	5,748	9,014	8,905	9,113
Oct.	5,776	7,409	9,021	11,666
Nov.	....	6,943	6,427	10,105
Dec.	....	4,414	5,892	6,908

YEARLY TOTALS

1955	81,910	1950	396,715
1954	86,205	1949	279,491
1953	154,466	1948	281,612
1952	202,143	1947	366,849
1951	269,946	1946	124,616

American Home Laundry Manufacturers' Association.

Coal and Wood Cooking Stoves

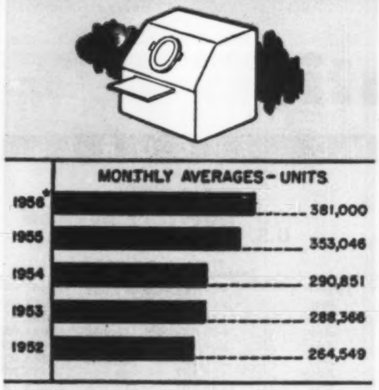
Shipments—Units

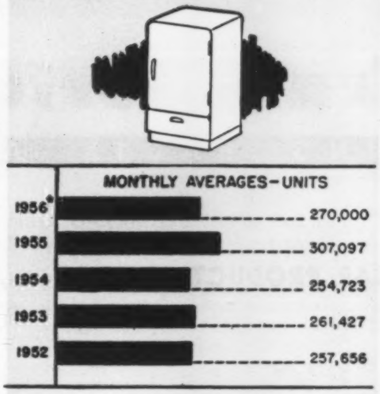
	1956	1955	1954	1953
Jan.	5,084	5,564	4,683	8,723
Feb.	5,039	5,527	6,110	8,089
Mar.	4,958	6,063	5,643	8,125
Apr.	4,572	4,283	5,876	7,420
May	4,159	4,107	3,468	5,075
June	4,154	4,817	4,206	5,435
July	4,065	5,367	4,351	5,796
Aug.	7,183	6,460	6,294	7,006
Sept.	5,789	7,752	7,708	9,636
Oct.	....	6,834	7,320	7,543
Nov.	....	7,053	6,652	6,876
Dec.	....	6,476	5,586	5,516

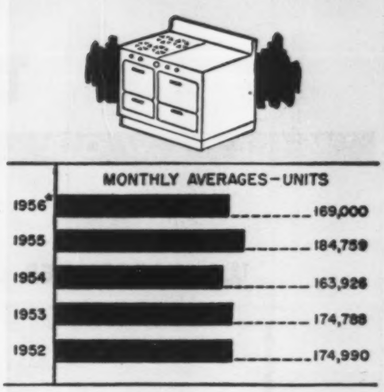
YEARLY TOTALS

1955	70,303	1953	85,240	1951	120,700
1954	67,897	1952	105,486	1950	151,162

U.S. Bureau of the Census.







WASHERS

Sales Billed—Units

	1956	1955	1954
Jan.	393,717	357,354	249,956
Feb.	405,631	353,214	295,171
Mar.	405,744	370,555	307,862
Apr.	324,238	313,461	258,712
May	315,249	341,759	246,944
June	340,235	354,470	303,455
July	380,172	245,879	242,863
Aug.	373,925	403,770	293,243
Sept.	402,631	414,914	379,666
Oct.	449,409	362,335	339,169
Nov.	......	361,341	308,368
Dec.	......	357,503	264,803

YEARLY TOTALS

1955	4,236,555	1952	3,174,588
1954	3,490,212	1951	3,327,236
1953	3,460,396	1950	4,311,018

American Home Laundry Manufacturers' Association.

ELECTRIC REFRIGERATORS

Domestic Sales—Units

	1956	1955	1954
Jan.	272,866	361,981	325,806
Feb.	272,098	318,812	308,707
Mar.	341,902	359,574	303,535
Apr.	297,207	327,700	249,388
May	299,052	354,837	252,712
June	302,952	358,798	278,576
July	303,774	301,638	302,402
Aug.	260,440	291,376	240,693
Sept.	243,581	289,623	250,071
Oct.	......	216,820	173,767
Nov.	......	217,364	160,781
Dec.	......	286,643	210,239

YEARLY TOTALS

1955	3,685,166	1949	3,704,269
1954	3,056,677	1948	3,976,091
1953	3,137,130	1947	2,994,297
1952	3,091,878	1946	1,811,326
1951	3,465,824	1945	267,061
1950	5,637,108	1944	40,034

* Estimated.
National Electrical Manufacturers Assn.

HOUSEHOLD GAS RANGES

Shipments—Units

	1956	1955	1954
Jan.	153,500	151,309	134,716
Feb.	178,400	184,173	149,620
Mar.	181,900	215,404	185,502
Apr.	161,400	180,339	168,946
May	166,800	184,253	159,779
June	169,500	201,160	170,099
July	146,800	143,478	130,639
Aug.	187,800	213,773	172,590
Sept.	191,000	212,262	194,743
Oct.	195,900	202,287	189,505
Nov.	......	178,208	168,805
Dec.	......	150,466	142,169

YEARLY TOTALS

1955	2,217,112	1952	2,099,879
1954	1,967,113	1951	2,250,656
1953	2,097,462	1950	2,893,681

U.S. Bureau of the Census (1950-1955); Gas Appliance Manufacturers Association (1956).

Automatic Tumbler Dryers

Factory Sales—Units

	1956	1955	1954	1953
Jan.	166,243	115,383	82,195	62,260
Feb.	148,522	109,215	62,488	57,136
Mar.	113,031	113,498	54,796	49,593
Apr.	64,923	73,978	37,661	28,556
May	55,330	49,228	26,533	32,867
June	58,441	70,616	30,297	32,789
July	117,548	60,516	40,755	33,296
Aug.	144,537	136,190	80,165	70,774
Sept.	192,724	169,905	107,084	86,461
Oct.	206,929	166,889	122,182	81,839
Nov.	......	157,153	138,254	78,167
Dec.	......	161,823	115,341	82,730
Total	......	1,384,394	897,751	696,468

American Home Laundry Manufacturers' Association.

Household Electric Ranges

Domestic Sales—Units

	1956	1955	1954
Jan.	107,736	134,782	100,676
Feb.	119,812	125,351	108,063
Mar.	114,443	127,298	112,232
Apr.	110,895	105,566	90,940
May	81,804	106,199	80,812
June	80,700	102,430	83,517
July	77,392	83,652	79,013
Aug.	61,794	72,304	74,283
Sept.	79,463	98,345	97,585
Oct.	......	101,370	82,873
Nov.	......	86,429	77,383
Dec.	......	115,910	83,339

YEARLY TOTALS

1955	1,259,636	1949	887,953
1954	1,070,716	1948	1,341,497
1953	1,113,611	1947	1,016,536
1952	901,860	1946	542,168
1951	1,244,645	1945	146,046
1950	1,580,613	1944	42,712

National Electrical Manufacturers Association.

Standard Vacuum Cleaners

Sales Billed—Units

	1956	1955	1954
Jan.	302,203	248,941	221,233
Feb.	286,386	261,183	199,035
Mar.	395,686	356,444	276,464
Apr.	352,873	241,870	220,849
May	326,008	255,941	209,434
June	248,326	239,728	195,781
July	259,774	206,758	193,607
Aug.	276,932	252,691	185,397
Sept.	320,278	306,507	238,235
Oct.	371,998	349,654	263,197
Nov.	......	307,267	237,882
Dec.	......	243,457	217,022

YEARLY TOTALS

1955	3,270,441	1952	2,841,803
1954	2,658,136	1951	2,729,104
1953	2,777,756	1950	3,529,412

Vacuum Cleaner Manufacturers' Association.

Gas Water Heaters

Shipments—Underfired and Sidearm Types

	1956		1955	
	Units	Value, Thousands of Dollars	Units	Value, Thousands of Dollars
Jan.	224,004	12,472	200,001	10,696
Feb.	246,098	13,364	214,703	11,299
Mar.	254,786	13,989	248,754	13,467
Apr.	230,056	12,178	231,694	12,534
May	231,388	12,397	216,731	11,964
June	236,758	12,856	214,607	11,729
July	226,532	11,972	207,226	10,901
Aug.	237,962	13,001	260,438	14,153
Sept.	217,277	11,634	224,027	12,122
Oct.	......	.....	218,521	12,033
Nov.	......	.....	184,761	10,355
Dec.	......	.....	175,173	9,723

YEARLY TOTALS

	Units	Value
1955	2,596,636	$140,976,000
1954	2,235,618	116,430,000
1953	2,274,032	117,220,000

U.S. Bureau of the Census.

Electric Flat Irons

Sales Billed—Units

	1956	1955	1954
January	267,256	297,830	269,594
February	464,266	338,551	366,559
March	715,634	421,919	402,640
April	373,226	343,181	214,059
May	364,213	381,055	215,320
June	538,702	737,103	307,866
July	762,318	584,584	628,867
August	560,787	499,913	634,392
September	682,341	781,010	709,934
October	......	660,584	650,232
November	......	559,606	708,514
December	......	270,668	333,252
Total	......	5,876,004	5,441,229

YEARLY TOTALS

1953	6,444,730	1951	6,012,727
1952	5,255,044	1950	5,866,575

National Electrical Manufacturers Asociation.

Electric Water Heaters

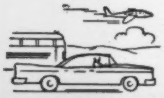
Domestic Unit Sales of Storage Tank Type

	1956	1955	1954
January	52,144	47,067	41,136
February	57,821	57,063	46,062
March	57,364	63,829	55,684
April	57,341	58,105	53,110
May	57,218	63,143	52,773
June	58,654	69,729	54,837
July	55,169	58,246	50,096
August	49,772	53,046	49,248
September	54,019	65,591	60,730
October	.....	51,337	48,182
November	.....	36,140	43,033
December	.....	41,588	37,279

YEARLY TOTALS

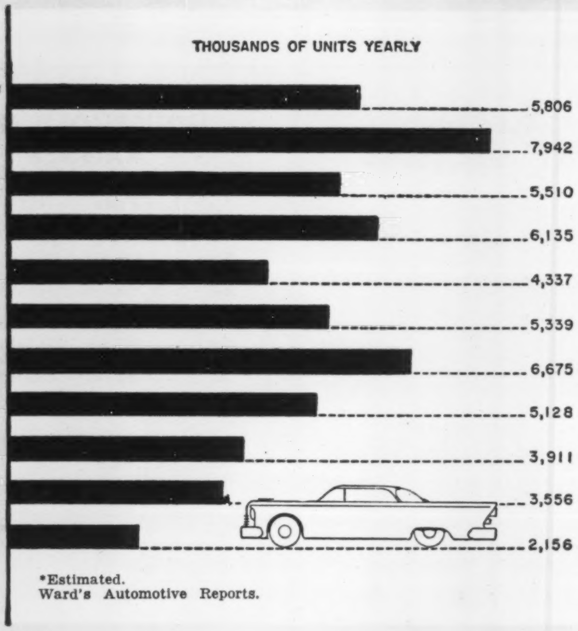
1955	664,884	1950	798,682
1954	592,170	1949	508,814
1953	588,773	1948	706,389
1952	546,307	1947	817,717
1951	661,459	1946	399,826

National Electrical Manufacturers Association.



Transportation

U.S. PASSENGER CAR PRODUCTION



*Estimated.
Ward's Automotive Reports.

TRUCK TRAILERS

	Production, By Types of Trailers									Shipments	
	Vans	Tanks	Pole, Pipe & Logging	Platforms	Low-Bed Heavy Haulers	Dump Trailers	All Other†	Trailer Chassis Only	Total Production, Units	Units	Value (000)
1956											
9 Mos.	31,867	4,928	1,611	9,027	2,538	1,812	2,215	2,949	56,947	52,499	$255,823
Jan.	3,824	501	143	935	256	133	293	148	6,233	4,781	23,001
Feb.	3,815	499	155	1,004	309	160	265	217	6,424	4,804	23,582
Mar.	3,797	559	186	1,125	305	245	270	379	6,866	6,564	31,043
Apr.	4,165	522	249	997	333	219	317	353	7,155	6,874	33,619
May	3,975	598	251	1,172	310	238	215	437	7,196	7,098	34,857
June	3,725	635	234	1,116	336	233	259	441	6,979	6,959	34,433
July	2,818	461	154	934	221	192	180	262	5,222	4,962	24,274
Aug.	3,273	630	135	976	265	201	188	350	6,018	5,630	27,455
Sept.	2,475	523	104	768	203	191	228	362	4,854	4,827	23,559
Oct.	....	...	...	...	...	...	...	...	....	....	.....
Nov.	....	...	...	...	....	...	...	...	....	....	.....
Dec.	....	...	...	...	...	...	...	...	....	....	.....
1955	47,585	5,843	2,202	10,792	2,979	2,028	3,798	2,760	77,987	76,468	$371,413
Jan.	2,850	369	124	648	201	92	322	148	4,754	4,458	21,435
Feb.	3,092	430	130	746	187	97	351	197	5,230	4,942	23,370
Mar.	3,740	496	204	859	289	169	389	262	6,408	6,337	29,887
Apr.	3,704	450	205	835	295	178	354	292	6,313	6,363	29,846
May	3,843	424	223	845	267	192	249	302	6,345	6,273	29,572
June	4,491	528	251	1,028	308	203	276	286	7,377	6,957	33,072
July	3,593	416	277	832	216	182	291	190	5,997	5,897	28,809
Aug.	4,499	519	212	1,100	199	209	340	205	7,283	7,079	35,115
Sept.	4,316	571	191	1,067	240	237	350	217	7,189	7,087	35,658
Oct.	4,259	582	133	1,054	292	125	325	207	6,977	6,990	35,278
Nov.	4,742	549	114	913	253	145	252	209	7,177	7,017	34,435
Dec.	4,456	509	132	865	232	199	299	245	6,937	7,068	34,936

YEARLY TOTALS

	Production, Units	Shipments			Production, Units	Shipments	
		Units	Value			Units	Value
1954........	55,399	54,537	$245,227,000	1951........	67,384	64,691	$245,315,000
1953........	97,102	96,699	294,849,000	1950........	64,617	65,966	229,685,000
1952........	58,078	57,973	228,378,000	1949........	33,097	34,273	119,098,000

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†Includes off-highway, auto transport, public utility trailers and special trailers for Defense department. U.S. Bureau of the Census.

U.S. Auto Production

	Passenger Cars	Trucks	Total
1956*	5,805,749	1,091,931	6,897,680
Jan.	611,190	105,856	717,046
Feb.	554,667	101,607	656,274
Mar.	575,559	105,442	681,001
Apr.	547,766	99,304	647,070
May	471,994	96,064	568,058
June	430,141	88,246	518,387
July	448,804	84,924	533,728
Aug.	401,997	90,484	492,481
Sept.	190,709	61,624	252,333
Oct.	388,922	95,380	484,302
Nov.* ...	574,000	88,000	662,000
Dec.* ...	610,000	75,000	685,000
1955	7,942,132	1,246,442	9,188,574
Jan.	659,508	92,035	751,543
Feb.	675,495	61,893	737,388
Mar.	794,015	110,243	904,258
Apr.	753,851	128,937	882,788
May	724,892	129,869	854,761
June	649 393	119,436	768,829
July	659,763	107,106	766,869
Aug.	614,493	97,349	711,842
Sept.	461,591	87,475	549,066
Oct.	517,813	95,906	613,719
Nov.	749,061	117,182	866,243
Dec.	682,257	99,011	781,268
1954	5,509,550	1,022,609	6,532,159
1953	6,134,534	1,203,835	7,338,369
1952	4,337,481	1,218,045	5,555,526
1951	5,338,820	1,412,149	6,750,969
1950	6,674,933	1,344,227	8,019,160
1949	5,128,187	1,132,138	6,260,325
1948	3,910,700	1,369,472	5,280,172
1947	3,556,126	1,236,703	4,792,829
1946	2,155,935	942,317	3,098,252
1945	83,786	701,090	784,876

Canadian Auto Production

	Passenger Cars	Trucks	Total
1956*	373,170	100,114	473,284
Jan.	24,969	4,652	29,621
Feb.	23,364	5,900	29,264
Mar.	37,837	9,364	47,201
Apr.	47,414	11,590	59,004
May	46,103	11,780	57,883
June	41,947	10,407	52,354
July	39,600	9,753	49,353
Aug.	12,257	5,741	17,998
Sept.	6,164	5,445	11,609
Oct.	22,915	7,682	30,597
Nov.* ...	35,100	8,800	43,900
Dec.* ...	35,500	9,000	44,500
1955	377,598	75,081	452,679
Jan.	25,602	3,435	29,037
Feb.	29,830	3,120	32,950
Mar.	43,824	6,713	50,537
Apr.	42,754	11,116	53,870
May	46,349	11,891	58,240
June	45,205	10,782	55,987
July	38,882	9,161	48,043
Aug.	18,808	5,265	24,073
Sept.	15,452	3,322	18,774
Oct.	20,250	2,956	23,206
Nov.	26,316	3,181	29,497
Dec.	24,326	4,139	28,465
1954	285,595	66,331	351,926
1953	366,535	117,236	483,771
1952	284,622	149,107	433,729
1951	281,634	133,160	414,794
1950	282,655	105,425	388,080
1949	192,981	97,955	290,936
1948	167,841	95,819	263,660
1947	167,441	92,590	260,031
1946	91,871	79,657	171,528
1945	1,868	130,928	132,796

Ward's Automotive Reports. *Estimated.

Bicycles Shipped

1956*......	1,775,000	1951.......	1,800,000
1955.......	1,729,300	1950.......	1,950,000
1954.......	1,500,000	1949.......	1,600,000
1953.......	2,000,000	1948.......	2,750,000
1952.......	1,910,000	1947.......	2,750,000

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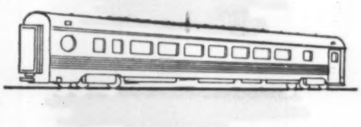
*Estimated.



Railroad Passenger Car Shipments

Number of Cars

	1956	1955	1954	1953	1952
Jan.	42	40	29	15	8
Feb.	53	36	40	17	21
Mar.	54	45	59	39	4
Apr.	25	36	64	37	12
May	53	49	41	27	2
June	40	55	44	26	13
July	29	39	65	37	8
Aug.	48	45	52	42	5
Sept.	46	355	42	34	13
Oct.	26	206	38	46	11
Nov.	..	38	54	44	11
Dec.	..	39	57	27	20

MONTHLY AVERAGES

1955....	82	1949....	83	1943....	59
1954....	49	1948....	69	1942....	33
1953....	33	1947....	58	1941....	30
1952....	11	1946....	114	1940....	23
1951....	23	1945....	77	1939....	23
1950....	80	1944....	83	1938....	29

American Railway Car Institute.

Busses

Shipments from U.S. Factories

	1956	1955	1954	1953
January	253	190	405	254
February	278	176	328	190
March	434	325	348	236
April	371	519	379	145
May	362	313	323	267
June	503	309	351	380
July	307	296	245	376
August	429	434	309	447
September	368	223	326	348
October	...	469	372	519
November	...	359	305	371
December	...	410	427	424
Total	...	4,023	4,118	4,057

YEARLY TOTALS

1952..........	5,375	1947..........	19,110
1951..........	9,460	1946..........	10,091
1950..........	4,908	1945..........	9,500
1949..........	5,511	1944..........	5,799
1948..........	12,299	1943..........	1,613

Automobile Manufacturers Association.

New Transit Equipment Delivered

	Surface Cars	Subway & Elevated Cars	Trolley Coaches	Motor Busses	Total
1956*....	0	394	0	2,800	3,194
1955.....	0	288	43	2,098	2,429
1954.....	0	260	0	2,225	2,485
1953.....	0	0	0	2,246	2,246
1952.....	19	0	224	1,749	1,992
1951.....	56	140	600	4,552	5,348
1950.....	4	199	179	2,668	3,050
1949.....	273	415	680	3,358	4,726
1948.....	478	248	1,430	7,009	9,165
1947.....	626	2	955	12,029	13,612
1946.....	421	0	266	6,463	7,150
1945.....	332	0	161	4,441	4,934

* Estimated.
American Transit Association.

Batteries Shipped

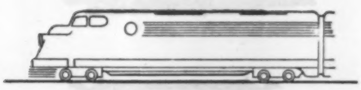
Automotive Replacement Only—Thousands

	1956	1955	1954	1953	1952	1951
Jan.	2,005	1,478	1,788	1,571	1,639	1,979
Feb.	1,305	1,647	1,422	1,162	963	1,469
Mar.	1,313	1,321	1,194	1,202	769	1,176
Apr.	1,332	1,281	1,150	1,245	850	1,892
May	1,715	1,572	1,391	1,455	1,137	1,480
June	1,760	1,794	1,834	2,004	1,535	1,443
July	2,121	2,024	2,288	2,528	2,526	1,705
Aug.	2,532	2,777	2,481	2,707	2,905	2,239
Sept.	2,675	3,039	2,728	2,852	2,874	2,172
Oct.	....	3,039	2,667	2,825	3,112	2,640
Nov.	....	2,627	2,410	2,173	2,168	2,232
Dec.	....	2,556	1,796	1,890	1,975	1,792
Totals	....	25,155	23,149	23,614	22,453	22,219

YEARLY TOTALS

1950..........	24,442	1949..........	19,383

U.S. Department of Commerce.



New Locomotive Units Put in Service by Class 1 Railroads

	Diesel-Electric	Electric	Total
1956			
10 Mos.	1,218	3	1,221
January	126	0	126
February	118	0	118
March	155	0	155
April	136	0	136
May	126	0	126
June	124	0	124
July	120	0	120
August	127	0	127
September	93	0	93
October	93	3	96
November	...	..	...
December	...	..	...
1955			
January	121	0	121
February	100	0	100
March	82	3	85
April	105	2	107
May	101	2	103
June	81	2	83
July	70	1	71
August	31	0	31
September	85	0	85
October	108	0	108
November	131	0	131
December	157	0	157

YEARLY TOTALS

1955	1,172	10	1,182
1954	1,097	16†	1,113
1953	2,091	19‡	2,110

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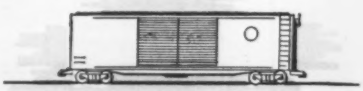
†Comprised of 15 gas turbine-electric and 1 steam turbine-electric.

‡Comprised of 4 gas turbine-electric and 15 steam.

Association of American Railroads.



Freight Cars Ordered

Domestic

	Car Builders	Railroad Shops	Total No. Cars
1956			
10 Mos.	27,033	5,597	32,630
Jan.	1,806	12	1,818
Feb.	1,441	234	1,675
Mar.	1,490	128	1,618
Apr.	5,449	1,110	6,559
May	1,931	472	2,403
June	2,829	30	2,859
July	1,374	1,268	2,642
Aug.	2,486	89	2,575
Sept.	3,816	133	3,949
Oct.	4,411	2,121	6,532
Nov.	....	....	....
Dec.	....	....	....
1955	84,838	84,847	169,685
Jan.	2,749	2,338	5,087
Feb.	770	1,906	2,676
Mar.	1,704	452	2,156
Apr.	1,185	1,517	2,702
May	2,138	773	2,911
June	10,231	3,095	13,326
July	9,613	8,394	18,007
Aug.	9,255	4,150	13,405
Sept.	2,518	710	3,228
Oct.	6,195	6,649	12,843
Nov.	17,289	33.777	51,066
Dec.	21,192	21,086	42,278

YEARLY TOTALS

1954	14,240	7,736	21,976
1953	23,444	10,136	33,580
1952	22,672	11,697	34,369
1951	56,112	36,119	92,231
1950	109,576	46,156	155,732

American Railway Car Institute.

FREIGHT CAR SHIPMENTS

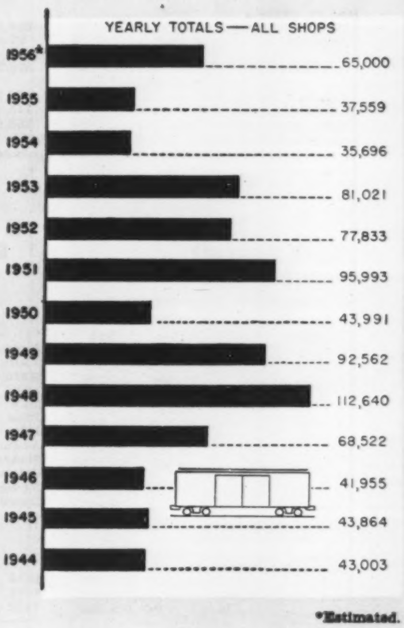
Domestic—Number of Cars

	Car-Builders	Railroad Shops	Total No. Cars
1956			
10 Mos. .	33,790	19,217	53,007
Jan. ..	2,981	1,218	4,199
Feb. ..	3,152	1,729	4,881
Mar. ..	4,326	1,623	5,949
Apr. ..	4,128	1,815	5,943
May ..	4,493	2,174	6,667
June ..	3,261	2,289	5,550
July ..	3,117	2,227	5,344
Aug. .	2,783	2,581	5,364
Sept. .	1,821	1,623	3,444
Oct. ..	3,728	1,938	5,666
Nov. .	....	....	....
Dec. ..	....	....	....
1955 ...	23,787	13,772	37,559
Jan. ..	1,605	409	2,014
Feb. ..	1,913	540	2,453
Mar. .	2,068	765	2,833
Apr. .	1,664	1,086	2,750
May .	2,438	1,645	4,083
June ..	1,690	1,325	3,015
July ..	1,284	1.014	2,298
Aug. .	1,935	1,842	3,777
Sept. .	1,708	1,573	3,281
Oct. ..	2,455	1,377	3,832
Nov. .	2,331	1,096	3,427
Dec. .	2,696	1,100	3,796

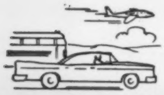
YEARLY TOTALS

1954	22,318	13,378	35,696
1953	53,298	27,723	81,021
1952	53,587	24,246	77,833
1951	67,744	28,249	95,993
1950	24,443	19,548	43,991

American Railway Car Institute.



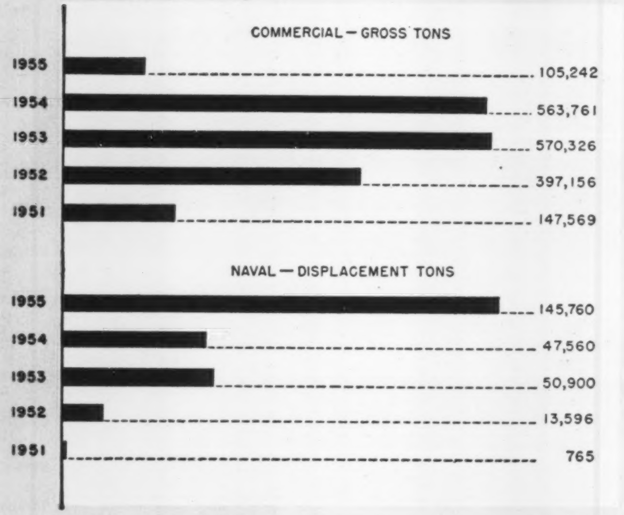
*Estimated.



Transportation

SHIPS DELIVERED FROM PRIVATE YARDS

(UNITED STATES)



Shipbuilding in Private Yards of U. S.

(Steel vessels of 1000 gross tons or more)

	1955		1954	
COMMERCIAL VESSELS	Number	Tons†	Number	Tons†
Under construction Jan. 1	15	224,822‡	47	670,452‡
Suspended during year	..	......	1	18,735
Contracted for during year	18	195,760	7	122,360
Total	33	420,582	53	774,077
Launched during year	3	47,580	31	472,871
Delivered during year	8	105,242	38	563,761
Under construction Dec. 31	25	315,340	15	210,316
NAVAL VESSELS				
Under construction Jan. 1	44	306,550‡	31	211,980‡
Contracted for during year	13	92,670	26	138,420
Total	57	399,220	57	350,400
Launched during year	13	72,970	14	131,520
Delivered during year	14	145,760	13	47,560
Under construction Dec. 31	43	253,460	44	302,840

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†Gross tons for commercial vessels and displacement tons for naval vessels.
‡Revised.
Shipbuilders Council of America.

Civil Aircraft

Complete Airplanes Shipped

	Number		Value (Thousands)	
	1956	1955	1956	1955
January	537	350	$22,053	$23,337
February	614	357	31,859	26,041
March	656	480	29,562	27,767
April	692	453	30,229	17,794
May	714	492	35,145	31,813
June	648	543	40,270	34,088
July	507	358	32,280	28,817
August	681	249	46,294	24,427
September	613	352	41,137	18,571
October	...	353	.....	17,003
November	...	348	.....	7,694
December	...	485	.....	13,898

YEARLY TOTALS

	Number	Value
1955	4,820	$271,250,000
1954	3,389	295,738,000
1953	4,134	244,418,000

U.S. Bureau of the Census.

Engines for Civil Aircraft

Shipments

	Number		Value (Thousands)	
	1956	1955	1956	1955
January	930	626	$6,800	$5,996
February	976	626	6,923	6,115
March	1,065	680	7,600	6,319
April	949	657	7,967	5,169
May	1,038	704	9,459	4,780
June	977	706	8,682	4,329
July	996	522	8,420	4,146
August	1,038	464	8,036	3,177
September	793	577	9,938	3,807
October	...	614	....	4,285
November	...	688	....	4,677
December	...	775	....	6,347

YEARLY TOTALS

	Number	Value
1955	7,639	$59,147
1954	5,519	60,647
1953	6,647	70,854

U.S. Bureau of the Census.

Commercial Ship Construction

Steel self-propelled vessels of 2000 gross tons and over built in private U.S. yards.†

Year	No.	Gross Tonnage	Year	No.	Gross Tonnage
1955	8	105,242	1949	34	538,873
1954	38	563,761	1948	29	164,482
1953	45	570,326	1947	50	286,473
1952	31	397,156	1946	88	672,554
1951	10	147,569	1945	1,067	7,663,362
1950	26	415,499	1944	1,463	11,404,404

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†On Jan. 1, 1956, 25 steel vessels of 1000 gross tons or over aggregating 315,340 gross tons were under construction, compared with 15 vessels aggregating 210,316 gross tons on Jan. 1, 1955.

TYPES OF VESSELS CONSTRUCTED—1955

(Steel Vessels of 1000 Gross Tons or Over)

Type	Number	Gross Tonnage
Tanker	4	55,312
Cargo	3	37,758
Self-Unloader	1	12,172
Total	8	105,242

CONTRACTED FOR IN 1955

(Steel Vessels of 1000 Gross Tons or Over)

Type	Number	Gross Tonnage
Cargo	4	19,500
Tanker	8	118,260
Ore Carrier	2	7,600
Passenger-Cargo	2	36,400
Passenger-Auto Ferry	1	2,000
Roll-on Roll-off	1	12,000
Total	18	195,760

UNCOMPLETED VESSELS

(Steel Vessels of 1000 Gross Tons or Over)
Jan. 1, 1956

Type	Number	Gross Tonnage
Tanker	14	225,260
Auxiliary Cargo Attack	1	12,580
Cargo	4	19,500
Ore Carrier	2	7,600
Passenger-Cargo	2	36,400
Passenger-Auto Ferry	1	2,000
Roll-on Roll-off	1	12,000
Total	25	315,340

Naval Shipbuilding

PRIVATE YARDS' NAVAL BACKLOG

Jan. 1, 1956

Type	Number	Displacement Tonnage
Aircraft Carrier	2	112,300
Destroyer	10	27,950
Destroyer Escort	10	12,840
Submarine	7	16,770
Landing Ship, Dock	4	27,520
Landing Ship, Tank	6	21,000
Oiler	1	11,600
Ammunition Ship	2	20,000
Frigate	1	3,480
Total	43	253,460

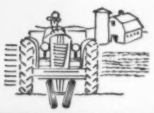
CONTRACTED FOR IN 1955

Attack Aircraft Carrier	1	56,300
Submarine	2	2,800
Nuclear Powered Submarine	2	4,490
Radar Picket Submarine (Nuclear Powered)	1	4,600
Landing Ship, Tank	6	21,000
Frigate	1	3,480
Total	13	92,670

DELIVERED IN 1955

Destroyer	1	2,780
Escort Vessel	1	1,340
Nuclear Powered Submarine	1	2,980
Landing Ship, Dock	2	13,760
Ice Breaker	1	5,100
Store Ship	2	15,900
Attack Aircraft Carrier	1	56,000
Oiler	4	46,400
Inshore Fire Support Ship	1	1,500
Total	14	145,760

Shipbuilders Council of America.



Farm Equipment

METALWORKING FACTS AND FIGURES

FARM MACHINERY AND EQUIPMENT

Manufacturers' Shipments in Thousands

(Except Tractors)

	Total	Domestic	Export
1954..........	$881,628	n.a.	n.a.
1953..........	1.003,264	$908,705	$94,559
1952..........	1,104,054	1,012,553	91,501
1951..........	1,218,966	1,123,918	95,048
1950..........	1,795,394	1,564,918	230,476
1949..........	1,813,008	1,550,934	262,074
1948..........	1,733,746	1.513,613	220,133
1947..........	1,294,686	1,132,686	162,000

Plows and Listers

	Total	Domestic	Export
1956 9 Mos.	$33,444	n.a.	n.a.
1955....	53,603	n.a.	n.a.
1954....	66,505	$57,445	$9,060
1953....	68,703	59,252	9,451
1952....	92,632	80,058	12 574
1951....	111.512	96,013	15,499
1950....	99,958	86,111	13,847

Harrows, Rollers, Pulverizers, Stalk Cutters

1956 9 Mos.	$45,732	n.a.	n.a.
1955....	62,505	n.a.	n.a.
1954....	70,487	$63,641	$6,846
1953....	78,785	73,011	5,774
1952....	84 558	78,310	6,248
1951....	94,188	86,922	7,266
1950....	77,706	70,756	6,950

Planting, Seeding and Fertilizing Machinery

1956 9 Mos.	$51,169	n.a.	n.a.
1955....	76,878	n.a.	n.a.
1954....	93,593	$89,697	$3,896
1953....	107,443	103,148	4,295
1952....	127,366	121,635	5 731
1951....	134,062	127,192	6,870
1950....	113,053	107,468	5,585

Cultivators and Weeders

1956 9 Mos.	$31,629	n.a.	n.a.
1955....	48,871	n.a.	n.a.
1954....	41,537	$38,262	$3,275
1953....	54,829	51,665	3,164
1952....	71 605	67,725	3,880
1951....	80,983	75,987	4,996
1950....	57,082	52,866	4,216

Sprayers and Dusters

1956 9 Mos.	$28,886	n.a.	n.a.
1955....	32,622	n.a.	n.a.
1954....	37,793	$33,987	$3,806
1953....	34,701	31 416	3,285
1952....	36,429	32,288	4,141
1951....	42,530	37,718	4,812
1950....	36,959	32,059	4,900

Harvesting Machinery

1956 9 Mos.	$163,149	n.a.	n.a.
1955....	214,029	n.a.	n.a.
1954....	252,663	$219,611	$33,052
1953....	294,024	248 001	46,023
1952....	309,384	272,329	37,055
1951....	345,084	313 077	32,007
1950....	288,153	263,417	24,736

Haying Machinery

1956 9 Mos.	$99,334	n.a.	n.a.
1955....	153,755	n.a.	n.a.
1954....	147,413	$136,624	$10,789
1953....	191,441	179 071	12,370
1952....	202,962	191,267	11,695
1951....	209,546	196,615	12,931
1950....	154,979	146,560	8,419

Machines for Preparing Crops for Market or for Use

	Total	Domestic	Export
1956 9 Mos.	$17,116	n.a.	n.a.
1955....	28,509	n.a.	n.a.
1954....	34,105	$29,532	$4,573
1953....	29,919	25 745	4,174
1952....	31,461	26,878	4,583
1951....	36,406	31,178	5,228
1950....	30,552	26,255	4,297

Farm Poultry Equipment

1956....	n.a.	n.a.	n.a.
1955....	n.a.	n.a.	n.a.
1954....	$25,566	$24,153	$1,413
1953....	27,216	25,931	1,285
1952....	25,442	24,556	886
1951....	34 611	33,540	1,071
1950....	30,127	29,427	700

Farm Dairy Machines and Equipment

1956 9 Mos.	$12,552	n.a.	n.a.
1955....	15,234	n.a.	n.a.
1954....	22,183	$21,310	$873
1953....	24,370	22,818	1,552
1952....	21,471	19,778	1,693
1951....	22,310	20,668	1,642
1950....	22,969	20,905	2,064

Barn Equipment

1956....	n.a.	n.a.	n.a.
1955....	n.a.	n.a.	n.a.
1954....	$12,856	$12,610	$246
1953....	15,107	14,951	156
1952....	15,526	15,454	72
1951....	13,719	13,702	17
1950....	11,808	11,783	25

Farm Wagons, Trucks and Other Farm Transportation Equipment

1956 9 Mos.	$17,163	n.a.	n.a.
1955....	22,605	n.a.	n.a.
1954....	23,555	n.a.	n.a.
1953....	26,555	$25,213	$1,342
1952....	29,505	28,046	1,459
1951....	32,996	31,312	1,684
1950....	26,139	24,284	1,855

Barnyard Equipment

1956....	n.a.	n.a.	n.a.
1955....	n.a.	n.a.	n.a.
1954....	$16,742	$16,666	$76
1953....	12,507	12,439	68
1952....	15,064	15,005	59
1951....	21 641	21,574	67
1950....	17,777	17,739	38

Farm Elevators and Blowers

1956 9 Mos.	$25,352	n.a.	n.a.
1955....	37,089	n.a.	n.a.
1954....	36,630	n.a.	n.a.
1953....	37,664	$36,044	$1,620
1952....	40,649	39,224	1,425
1951....	39,378	38,420	958
1950....	34,682	33,766	916

n.a. = not available.
U.S. Bureau of the Census.

TRACTORS

Manufacturers' Shipments

TOTAL—ALL TYPES

Year	Number	Value (in thousands)
1954....	483,695	$718,406
1953....	652,761	948,287
1952....	667,824	924,615
1951....	777,467	1,042,719
1950....	698,344	820,031
1949....	720,644	792,881
1947....	638,451	516,815

WHEEL TYPE

(except garden)

Year	Number	Value (in thousands)
1956‡ 9 Mos..	181,140	$310,444
1955‡....	324,916	517,892
1954....	252 230	426,470
1953....	390,366	590,322
1952....	417,177	615,676
1951....	559,973	758,001
1950....	499,917	574,295
1949....	545,368	572,430
1948....	529,692	497,298
1947....	428,665	349,334

TRACKLAYING TYPE

Year	Number	Value (in thousands)
1956 9 Mos..	43,246	$365,283
1955....	48,684	357,112
1954....	40,230	266 829
1953....	50,597	328,696
1952....	48,155	280,841
1951....	49,142	259,960
1950....	44,600	223,487
1949....	43,849	199,423
1948....	39,573	162,007
1947....	37,534	134,330

GARDEN TYPE

Year	Number	Value (in thousands)
1954....	191,235	$25,107
1953....	211,798	29,269
1952....	202,492	28,098
1951....	168,352	24,758
1950....	153,827	22,249
1949....	131,427	21,028
1948....	169,421	30,052
1947....	172,252	33,151

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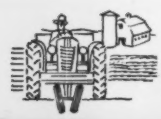
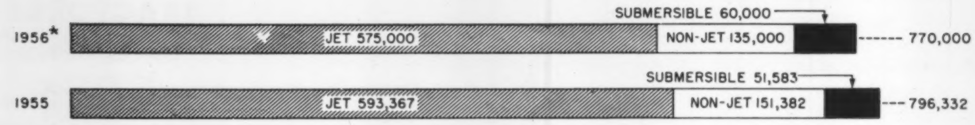
‡Except garden and contractors' off-highway types.
U.S. Bureau of the Census.



Farm Equipment

DOMESTIC WATER SYSTEMS

Factory Shipments



Jet Pump Systems

	Units	Value
1956*	575,000	....
Jan.	42,095	$3,577,000
Feb.	38,886	3,233,000
Mar.	40,687	3,407,000
Apr.	47,706	4,039,000
May	54,504	4,500,000
June	56,183	4,636,000
July	55,038	4,664,000
Aug.	60,814	5,039,000
Sept.	51,226	4,303,000
Oct.	.....	....
Nov.	.....	....
Dec.	.....	....
1955	593,367	$50,835,000
Jan.	39,683	3,472,000
Feb.	35,571	3,048,000
Mar.	49,893	4,207,000
Apr.	50,088	4,241,000
May	56,741	4,752,000
June	62,261	5,219,000
July	62,269	5,258,000
Aug.	63,591	5,507,000
Sept.	61,998	5,365,000
Oct.	46,624	4,100,000
Nov.	35,271	3,137,000
Dec.	29,377	2,529,000
1954	510,436	$46,277,000
1953	470,271	43,980,000
1952	432,872	41,769,000
1951	379,652	37,656,000
1950	449,768	38,935,000

U.S. Bureau of the Census.

Non-Jet Pump Systems

	Units	Value
1956*	135,000	....
Jan.	9,906	$861,000
Feb.	10,491	922,000
Mar.	9,363	836,000
Apr.	12,926	1,085,000
May	14,021	1,121,000
June	12,118	1,040,000
July	12,420	1,080,000
Aug.	12,936	1,098,000
Sept.	11,135	1,002,000
Oct.	.....	....
Nov.	.....	....
Dec.	.....	....
1955	151,382	$12,620,000
Jan.	9,039	800,000
Feb.	11,382	893,000
Mar.	14,421	1,093,000
Apr.	14,279	1,158,000
May	13,849	1,148,000
June	14,893	1,176,000
July	14,028	1,173,000
Aug.	16,093	1,320,000
Sept.	13,488	1,154,000
Oct.	11,467	1,016,000
Nov.	9,895	910,000
Dec.	8,548	779,000
1954	167,427	$13,596,000
1953	196,995	16,630,000
1952	249,145	25,972,000
1951	237,408	22,303,000
1950	272,879	21,269,000

Submersible Pumps†

	Units	Value
1956*	60,000	....
Jan.	3,409	$788,000
Feb.	3,654	781,000
Mar.	3,718	818,000
Apr.	4,636	973,000
May	6,452	1,333,000
June	7,235	1,482,000
July	5,976	1,290,000
Aug.	6,480	1,350,000
Sept.	5,977	1,178,000
Oct.	.....	....
Nov.	.....	....
Dec.	.....	....
1955	51,583	$11,444,000
Jan.	2,785	709,000
Feb.	2,801	697,000
Mar.	3,135	759,000
Apr.	3,053	704,000
May	4,321	977,000
June	5,438	1,255,000
July	5,195	1,149,000
Aug.	6,505	1,300,000
Sept.	6,071	1,213,000
Oct.	5,432	1,117,000
Nov.	4,001	880,000
Dec.	2,846	684,000
1954	43,362	$11,343,000
1953	34,785	8,649,000

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†Prior to 1953, submersible pumps were included under non-jet pumps.

*Estimated.

Domestic Hand and Windmill Pumps

Factory Shipments

1956	Units	Value
Jan.	14,325	$87,000
Feb.	17,633	111,000
Mar.	16,876	94,000
Apr.	13,029	88,000
May	11,774	90,000
June	18,444	118,000
July	19,898	123,000
Aug.	17,233	95,000
Sept.	12,539	83,000
1955	206,881	$1,343,000
Jan.	25,104	130,000
Feb.	18,644	114,000
Mar.	23,755	132,000
Apr.	19,519	155,000
May	18,988	113,000
June	19,181	107,000
July	17,516	111,000
Aug.	16,629	116,000
Sept.	15,313	111,000
Oct.	16,138	114,000
Nov.	8,643	78,000
Dec.	7,451	62,000
YEARLY TOTALS		
1954	223,282	$1,433,000
1953	225,754	1,667,000
1952	242,636	1,809,000
1951	245,791	1,725,000
1950	334,357	1,941,000
1949	327,415	2,186,000
1948	456,650	2,892,000
1947	368,532	2 322,000
1946	313,023	1,623,000
1945	314,638	1,689,000
1944	380,240	1,955 000
1943	368,249	1,730,000
1942	377,331	1,631,000
1941	490,586	1,896,000

U.S. Bureau of the Census.

Pump Jacks

Factory Shipments

1956	Units	Value
Jan.	2,505	$72,000
Feb.	2,137	65,000
Mar.	2,258	64,000
Apr.	2,018	68,000
May	1,274	38,000
June	2,078	70,000
July	1,803	55,000
Aug.	2,290	70,000
Sept.	1,646	56,000
1955	26,654	$771,000
Jan.	2,821	78 000
Feb.	1,781	50,000
Mar.	2,071	62,000
Apr.	2,047	57,000
May	2,103	58,000
June	1,929	55,000
July	1,904	57,000
Aug.	3,242	98,000
Sept.	3,147	96,000
Oct.	2,307	65,000
Nov.	1,703	50,000
Dec.	1,599	45,000
YEARLY TOTALS		
1954	27,136	$815,000
1953	29,801	893,000
1952	31,961	975,000
1951	37,461	1,149,000
1950	43,237	1,187,000
1949	36,854	1,034,000
1948	41,952	1,083,000
1947	54,187	1,450,000
1946	89,460	2,257,000
1945	62,451	1,418,000
1944	56,550	1,230,000
1943	31,065	640,000
1942	55,665	906,000
1941	59,058	856,000
1940	47,842	630,000
1939	37,133	464,000

U.S. Bureau of the Census.

Windmill Heads

Factory Shipments

1956	Units	Value
Jan.	618	$70,000
Feb.	600	72,000
Mar.	652	75,000
Apr.	1,081	116,000
May	1,116	138,000
June	806	85,000
July	1,019	119,000
Aug.	819	93,000
Sept.	779	101,000
1955	10,482	$1,106,000
Jan.	538	55,000
Feb.	698	73,000
Mar.	1,011	108,000
Apr.	1,133	97,000
May	1,202	141,000
June	719	66,000
July	828	85,000
Aug.	998	101,000
Sept.	1,020	111,000
Oct.	871	89,000
Nov.	820	100,000
Dec.	644	80,000
YEARLY TOTALS		
1954	11,289	$1,105,000
1953	10,783	988,000
1952	13,918	1,245,000
1951	16,700	1,498,000
1950	20,736	1,674,000
1949	19,188	1,675,000
1948	31,835	2,183,000
1947	39,076	2,424,000
1946	46,004	2,113,000
1945	41,761	1,786,000
1944	40,540	1,699,000
1943	34,523	1,537,000
1942	37,642	1,624,000
1941	43,159	1,757,000
1940	45,787	1,755,000
1939	52,706	2,100,000

U.S. Bureau of the Census.

Windmill Towers

Factory Shipments

1956	Units	Value
Jan.	276	$31,000
Feb.	243	29,000
Mar.	345	41,000
Apr.	372	39,000
May	457	56,000
June	273	32,000
July	403	44,000
Aug.	286	36,000
Sept.	380	48,000
1955	4,470	$526,000
Jan.	232	27,000
Feb.	274	33,000
Mar.	410	51,000
Apr.	411	46,000
May	472	56,000
June	368	38,000
July	384	46,000
Aug.	395	46,000
Sept.	354	42,000
Oct.	405	49,000
Nov.	380	45,000
Dec.	385	47,000
YEARLY TOTALS		
1954	4,911	$552,000
1953	5,088	477,000
1952	6,795	625,000
1951	9,416	832 000
1950	9,092	788,000
1949	9,843	901,000
1948	19,115	1,430,000
1947	22,269	1,351,000
1946	22,416	1,043,000
1945	20,603	863,000
1944	18,236	727,000
1943	11,632	480,000
1942	11,373	468,000
1941	14,950	670,000
1940	14,647	641,000
1939	17,418	808,000

U.S. Bureau of the Census.

Business Indexes

METALWORKING FACTS AND FIGURES

INDEXES OF INDUSTRIAL PRODUCTION

FEDERAL RESERVE BOARD—1947-1949 = 100

Total Industrial Production

Adjusted for Seasonal Variation

	1956	1955	1954	1953	1952
Jan.	143	132	125	134	121
Feb.	143	133	125	134	121
Mar.	141	135	123	135	121
Apr.	143	136	123	136	120
May	141	138	125	137	119
June	141	139	124	136	118
July	136	139	123	137	115
Aug.	142	140	123	136	123
Sept.	145	142	124	133	129
Oct.	145	143	126	132	130
Nov.	...	143	128	129	133
Dec.	...	144	130	126	133

YEARLY INDEXES

1956*...	143	1951....	120	1946....	90
1955....	139	1950....	112	1945....	107
1954....	125	1949....	97	1944....	125
1953....	134	1948....	104	1943....	127
1952....	124	1947....	100	1942....	106

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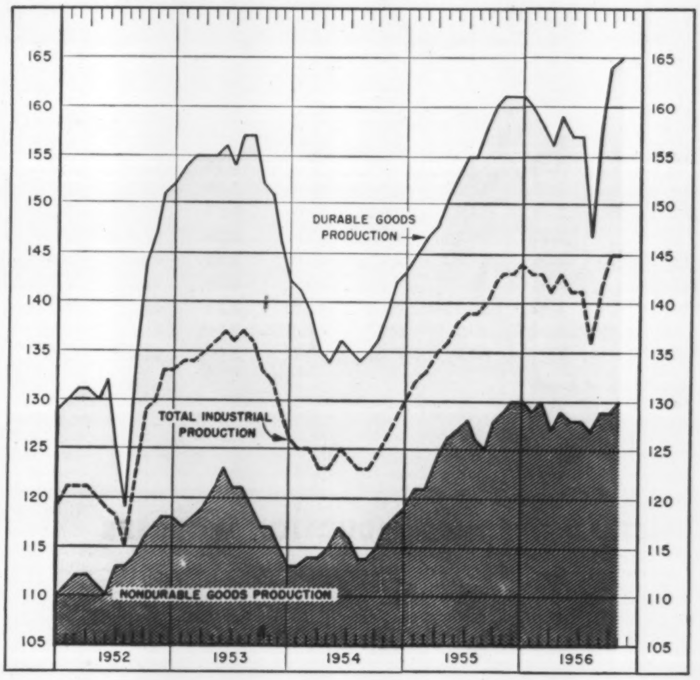
*Estimated.



Primary Metals

Adjusted for Seasonal Variation

	1956	1955	1954	1953	1952
Jan.	148	127	111	135	125
Feb.	148	131	109	137	125
Mar.	145	136	103	136	125
Apr.	146	138	103	136	116
May	141	140	106	139	116
June	138	143	108	137	63
July	68	134	103	136	56
Aug.	124	139	105	137	126
Sept.	148	146	105	130	132
Oct.	148	148	111	128	134
Nov.	...	149	118	122	136
Dec.	...	150	121	113	135

Metal Fabricating

Adjusted for Seasonal Variation

	1956	1955	1954	1953	1952
Jan.	170	157	155	168	137
Feb.	168	158	151	168	138
Mar.	166	160	147	168	139
Apr.	171	162	147	169	139
May	167	163	148	169	142
June	168	164	147	168	143
July	169	166	147	171	134
Aug.	172	168	148	171	142
Sept.	176	170	149	166	154
Oct.	173	173	150	166	159
Nov.	...	172	152	159	164
Dec.	...	172	154	156	166

Durable Goods

Adjusted for Seasonal Variation

	1956	1955	1954	1953	1952
Jan.	160	145	141	154	130
Feb.	158	147	139	155	131
Mar.	156	148	135	155	131
Apr.	159	151	134	155	130
May	157	153	136	156	132
June	157	155	135	154	125
July	147	155	134	157	119
Aug.	158	158	135	157	135
Sept.	164	160	137	152	144
Oct.	165	161	139	151	147
Nov.	...	161	142	146	151
Dec.	...	161	143	142	152

Nondurable Goods

Adjusted for Seasonal Variation

	1956	1955	1954	1953	1952
Jan.	129	121	113	117	111
Feb.	130	121	114	118	112
Mar.	128	124	114	119	112
Apr.	129	126	115	121	111
May	128	127	117	123	110
June	128	128	116	121	113
July	127	126	114	121	113
Aug.	129	125	114	119	114
Sept.	129	128	115	117	116
Oct.	130	129	117	117	117
Nov.	...	130	118	115	118
Dec.	...	130	119	112	118

Consumer Price Index

Cost of Living. 1947-1949=100

	1956	1955	1954	1953
January	114.6	114.3	115.2	113.9
February ...	114.6	114.3	115.0	113.4
March	114.7	114.3	114.8	113.6
April	114.9	114.2	114.6	113.7
May	115.4	114.2	115.0	114.0
June	116.2	114.4	115.1	114.5
July	117.0	114.7	115.2	114.7
August	116.8	114.5	115.0	115.0
September ..	117.1	114.9	114.7	115.2
October	117.7	114.9	114.5	115.4
November ...	....	115.0	114.6	115.0
December ...	....	114.7	114.3	114.9

MONTHLY AVERAGES

1956*......	116.2	1954.......	114.8
1955.......	114.5	1953.......	114.4

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*Estimated.

U.S. Bureau of Labor Statistics.

Wholesale Price Indexes

1947-1949=100

ALL COMMODITIES

	1956	1955
January	111.9	110.1
February	112.4	110.4
March	112.8	110.0
April	113.6	110.5
May	114.4	109.9
June	114.2	110.3
July	114.0	110.5
August	114.7	110.9
September	115.5	111.7
October	115.5	111.6
November	....	111.2
December	....	111.3

U.S. Bureau of Labor Statistics.

ALL COMMODITIES OTHER THAN FARM PRODUCTS AND FOOD

	1956	1955
January	120.4	115.2
February	120.6	115.7
March	121.0	115.6
April	121.6	115.7
May	121.7	115.5
June	121.5	115.6
July	121.4	116.5
August	122.5	117.5
September	123.6	118.5
October	123.6	119.0
November	....	119.4
December	....	119.8

Labor

METALWORKING FACTS AND FIGURES

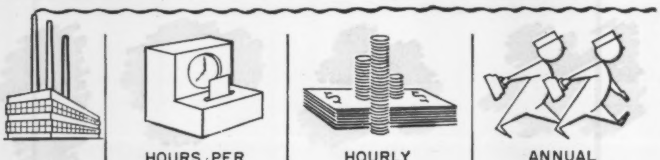
METALWORKING WAGES & HOURS (Production Workers)

(Average Hourly Wages and Average Weekly Hours)

	PRIMARY METALS		FABRICATED METAL PRODUCTS		MACHINERY Except Electrical		ELECTRICAL MACHINERY		TRANSPORTATION EQUIPMENT		INSTRUMENTS Related Products	
	Wages	Hours	Wages	Hours	Wages	Hours	Wages	Hours	Wages	Hours	Wages	Hours
1956												
Jan.	$2.33	41.9	$2.03	40.9	$2.17	42.7	$1.93	40.9	$2.25	40.6	$1.96	40.8
Feb.	2.32	41.1	2.02	41.1	2.17	42.6	1.93	40.6	2.24	39.9	1.96	41.0
Mar.	2.32	41.0	2.03	41.0	2.17	42.4	1.94	40.7	2.25	40.4	1.97	40.8
Apr.	2.33	41.2	2.04	41.1	2.18	42.5	1.96	41.0	2.26	40.6	1.98	41.1
May	2.33	41.0	2.04	40.8	2.18	42.2	1.97	40.7	2.27	39.6	1.99	40.8
June	2.34	40.9	2.06	41.0	2.19	42.0	1.97	40.6	2.29	39.9	1.99	40.6
July	2.27	40.0	2.06	40.8	2.20	41.8	1.98	40.0	2.29	40.6	2.01	40.6
Aug.	2.36	39.3	2.07	40.6	2.21	41.6	1.99	40.5	2.32	40.8	2.02	40.6
Sept.	2.41	41.2	2.11	41.6	2.25	42.3	2.01	41.0	2.36	41.4	2.04	41.3
Oct.	2.42	40.9	2.12	41.8	2.25	41.9	2.02	41.0	2.39	41.8	2.04	41.3
1955 (Av.)	2.24	41.2	1.98	41.5	2.09	41.8	1.88	40.8	2.23	41.9	1.91	40.8
1954 (Av.)	2.09	38.7	1.90	40.7	2.01	40.6	1.82	39.8	2.14	40.5	1.83	40.0

U.S. Department of Labor.

METALWORKING PRODUCTION WORKERS



	HOURS PER WEEK (average)	HOURLY EARNINGS (average)	ANNUAL EMPLOYMENT (average)
1956*	41.1 HOURS	$2.15	5,696,100
1955	41.3 HOURS	$2.05	5,622,100
1954	40.0 HOURS	$1.96	5,328,700

METALWORKING EMPLOYMENT

(All Wage and Salary Workers, in Thousands)

	TOTAL	Primary Metals	Fabricated Metal Products	Machinery Except Electrical	Electrical Machinery	Transportation Equip.	Instruments etc.
1956							
Jan.	7,553.8	1,345.6	1,134.5	1,689.1	1,162.5	1,891.3	330.8
Feb.	7,513.4	1,345.9	1,122.2	1,708.4	1,162.9	1,841.4	332.6
Mar.	7,481.6	1,342.5	1,117.0	1,720.1	1,162.2	1,805.6	334.2
Apr.	7,522.8	1,348.6	1,120.6	1,734.0	1,195.6	1,788.9	335.1
May	7,450.3	1,331.0	1,107.1	1,725.9	1,196.3	1,755.2	334.8
June	7,429.3	1,334.1	1,098.1	1,730.7	1,200.3	1,729.8	336.3
July	6,981.0	960.9	1,056.0	1,711.7	1,194.5	1,721.9	336.0
Aug.	7,389.3	1,306.7	1,095.0	1,717.5	1,221.9	1,706.8	341.4
Sept.	7,412.2	1,338.4	1,115.6	1,718.1	1,234.2	1,661.2	344.7
Oct.	7,564.7	1,346.5	1,135.6	1,725.8	1,254.3	1,754.7	347.8
1955 (Av.)	7,252.5	1,283.1	1,108.1	1,592.3	1,125.2	1,822.0	321.8
1954 (Av.)	6,927.3	1,181.2	1,049.8	1,555.9	1,086.4	1,735.0	319.0

U.S. Department of Labor.

*Estimated.

Steel Industry's Minimum Labor Rates

	Hourly wage (cents)	Per cent over 1915
1915	20.0	....
February 1, 1916	22.0	10.0
May 1, 1916	25.0	25.0
December 15, 1916	27.5	37.5
May 1, 1917	30.0	50.0
October 1, 1917	33.0	65.0
April 16, 1918	38.0	90.0
August 1, 1918	42.0	110.0
October 1, 1918	46.2	131.0
February 1, 1920	50.6	153.0
May 16, 1921	40.5	102.5
July 16, 1921	37.0	85.0
August 29, 1921	30.0	50.0
September 1, 1922	36.0	80.0
April 16, 1923	40.0	100.0
August, 1923	44.0	120.0
October 1, 1931	39.6	98.0
May 16, 1932	33.7	68.5
August 19, 1933 (NRA)	40.0	100.0
April 1, 1934	44.0	120.0
November, 1936	52.5	162.5
March, 1937	62.5	212.5
April, 1941	72.5	262.5
July, 1942	78.0	290.0
February, 1946	96.5	382.5
April, 1947	109.0	445.0
July 16, 1948	118.5	492.5
December 1, 1950	131.0	555.0
March 1, 1952	143.5	617.5
June 12, 1953	152.0	660.0
July 1, 1954	157.0	685.0
July 1, 1955	168.5	742.5
August 3, 1956	182.0	810.0

Compiled by STEEL.

Work Stoppages

1956	Number of Stoppages in Effect	Workers Involved	Man-Days Lost
9 Mos.	4,200	2,930,000	30,900,000
Jan.	350	190,000	2,000,000
Feb.	350	190,000	2,200,000
Mar.	350	175,000	2,000,000
Apr.	450	210,000	1,500,000
May	550	280,000	2,800,000
June	500	235,000	2,100,000
July	550	710,000	13,600,000
Aug.	550	725,000	3,200,000
Sept.	550	215,000	1,500,000
	Number of Stoppages Started	Workers Involved	Man-Days Lost
1955	4,320	2,650,000	28,200,000

U.S. Department of Labor.

Steel Employment, Wages, Hours and Payrolls

1956 By Months

	Number Employees (Wage and salaried workers)	Av. Hrly. Earnings (Hourly, piecework or tonnage wages)	Av. Hrs. per Week (Hourly, piecework or tonnage wages)	Total Payrolls (Wages and salaries)
Jan.	681,100	$2.617	39.5	$329,134,000
Feb.	683,700	2.613	40.5	317,326,000
Mar.	685,200	2.604	40.7	338,140,000
Apr.	687,900	2.621	39.7	326,740,000
May	679,800	2.619	40.1	333,570,000
June	683,000	2.640	39.0	322,400,000
July	a.	a.	a.	a.
Aug.	677,200	2.697	34.2	300,920,000
Sept.	687,900	2.784	39.2	338,990,000
Oct.	......	....	...	....
Nov.	......	....	...	....
Dec.	......	....	...	....
1955 By Months				
Jan.	605,100	$2.387	37.8	$258,824,000
Feb.	616,400	2.406	40.0	255,130,000
Mar.	629,900	2.385	41.1	288,229,000
Apr.	643,200	2.407	39.9	282,025,000
May	654,000	2.404	39.7	294,073,000
June	667,100	2.420	40.1	298,439,000
July	676,400	2.598	35.0	296,857,000
Aug.	679,900	2.572	38.9	320,730,000
Sept.	680,200	2.602	39.5	317,106,000
Oct.	677,900	2.600	39.4	325,114,000
Nov.	679,800	2.615	40.6	326,109,000
Dec.	681,800	2.618	39.1	330,645,000
1954 By Months				
Jan.	644,900	$2.294	35.7	$251,288,000
Feb.	636,100	2.299	37.2	236,574,000
Mar.	620,500	2.278	37.3	249,672,000
Apr.	609,400	2.296	35.8	232,638,000
May	606,400	2.314	34.9	234,413,000
June	608,900	2.315	36.0	236,406,000
July	607,600	2.368	33.4	232,796,000
Aug.	601,400	2.356	35.1	238,778,000
Sept.	597,400	2.368	35.7	234,595,000
Oct.	596,100	2.264	36.6	244,698,000
Nov.	598,800	2.391	37.6	247,722,000
Dec.	604,600	2.372	38.0	262,189,000
1953 By Months				
Jan.	683,800	$2.216	40.7	$285,361,000
Feb.	684,900	2.208	40.7	261,272,000
Mar.	683,100	2.206	40.3	281,421,000
Apr.	685,000	2.203	41.0	278,324,000
May	685,300	2.222	39.9	280,953,000
June	690,200	2.263	39.9	282,127,000
July	696,000	2.310	38.1	288,052,000
Aug.	695,600	2.318	38.2	287,253,000
Sept.	687,800	2.328	39.2	283,773,000
Oct.	678,200	2.307	40.1	290,583,000
Nov.	667,400	2.323	38.0	268,523,000
Dec.	655,800	2.279	37.0	263,944,000
MONTHLY AVERAGES AND TOTAL PAYROLLS				
1955	657,642	$2.501	39.3	$3,593,281,000
1954	611,008	2.335	36.1	2,901,769,000
1953	682,758	2.265	39.4	3,351,586,000
1952†	672,530	2.069	39.5	2,530,950,000
1951	670,717	1.945	40.2	2,881,170,000
1950	635,500	1.746	39.0	2,389,759,000
1949	620,500	1.703	34.5	2,061,770,000
1948	635,600	1.630	39.1	2,234,461,000
1947	616,300	1.513	38.6	1,986,600,000
1946	575,300	1.347	35.1	1,544,142,000
1945	551,200	1.248	44.2	1,645,332,700
1944	571,200	1.219	46.7	1,745,019,700
1943	625,700	1.135	43.0	1,649,227,000
1942	647,200	1.056	38.6	1,467,058,700
1941	633,000	.959	38.6	1,301,347,800

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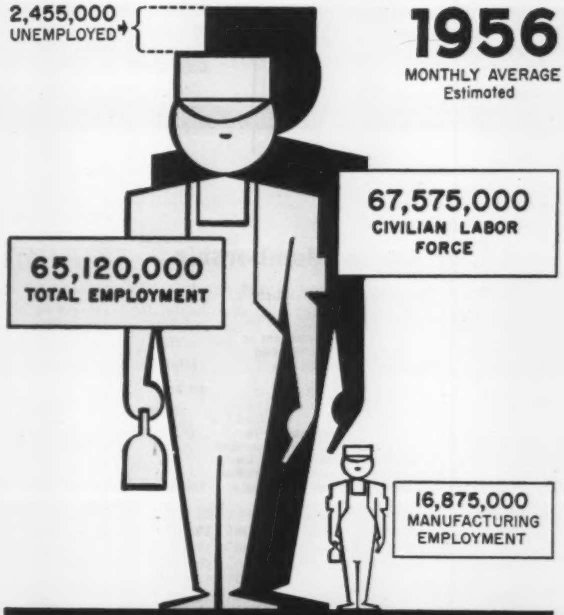
a.=No reports issued because of steelworkers' strike.
†10 Months.
American Iron & Steel Institute.



TOTAL U.S. EMPLOYMENT

(In Thousands)

1956 By Months

	Civilian Labor Force	Total Employment	Unemployment	Mfg. Employment
Jan.	65,775	62,891	2,885	16,842
Feb.	65,490	62,576	2,914	16,824
Mar.	65,913	63,078	2,834	16,764
Apr.	66,555	63,990	2,564	16,769
May	67,846	65,238	2,608	16,715
June	69,430	66,503	2,927	16,809
July	69,489	66,655	2,833	16,291
Aug.	58,947	66,752	2,195	17,034
Sept.	68,069	66,071	1,998	17,079
Oct.	68,082	66,174	1,909	17,184
Nov.	.....	.....	....	.....
Dec.	.....	.....	....	.....
1955 By Months				
Jan.	63,497	60,150	3,347	15,932
Feb.	63,321	59,938	3,383	16,064
Mar.	63,654	60,477	3,176	16,203
Apr.	64,647	61,685	2,962	16,257
May	65,192	62,703	2,489	16,337
June	66,696	64,016	2,679	16,577
July	67,465	64,994	2,471	16,477
Aug.	67,726	65,488	2,237	16,820
Sept.	66,882	64,733	2,149	16,919
Oct.	67,292	65,161	2,131	17,006
Nov.	67,206	64,807	2,398	17,052
Dec.	66,592	64,165	2,427	17,027
1955 Av.	65,847	63,193	2,654	16,556
1954 By Months				
Jan.	62,840	59,753	3,087	16,380
Feb.	63,725	60,055	3,670	16,265
Mar.	63,825	60,100	3,724	16,170
Apr.	64,063	60,598	3,465	15,948
May	64,425	61,119	3,305	15,781
June	65,445	62,098	3,347	15,839
July	65,494	62,148	3,347	15,587
Aug.	65,522	62,277	3,245	15,828
Sept.	65,244	62,145	3,100	15,983
Oct.	64,882	62,141	2,741	16,016
Nov.	64,624	61,732	2,893	16,066
Dec.	63,526	60,688	2,838	16,055
1954 Av.	64,468	61,238	3,230	15,993
MONTHLY AVERAGES				
1953	63,815	62,213	1,602	17,238
1952	62,966	61,293	1,673	16,334
1951	62,884	61,005	1,879	16,104
1950	63,099	59,957	3,142	14,967
1949	62,105	58,710	3,395	14,178
1948	61,442	59,378	2,064	15,321
1947	60,168	58,027	2,142	15,290
1946	57,520	55,250	2,270	14,461
1945	53,860	52,820	1,040	15,302
1944	54,630	53,960	670	17,111
1943	55,540	54,470	1,070	17,381
1942	56,410	53,750	2,660	15,051
1941	55,910	50,350	5,560	12,974

U.S. Department of Labor.
U.S. Department of Commerce.

Labor

METALWORKING FACTS AND FIGURES

Labor Union Membership

Thousands of Members

Year	AFL-CIO	Independent or Unaffiliated Unions	Total
1956*	16,100	1,800	17,900

	American Federation of Labor	Congress of Industrial Organizations	In-Dependent or Unaffiliated Unions	Total
1955* ...	10,900	5,200	1,800	17,900
1954	10,746	5,185	1,826	17,757
1953* ...	10,900	5,200	1,800	17,900
1952* ...	9,500	5,000	2,000–2,500	16,500–17,000
1951	9,500	5,000	2,000–2,500	16,500–17,000
1950	7,143	n.a.	2,400–2,800	14,000–16,000
1949	7,241	n.a.	2,000–2,300	14,000–16,000
1948	7,221	n.a.	2,200–2,500	14,000–16,000
1947	7,578	6,000	1,836	15,414
1946	7,152	6,000	1,822	14,974
1945	6,931	6,000	1,865	14,796
1944	6,807	5,935	1,879	14,621
1943	6,564	5,285	1,793	13,642
1942	5,483	4,195	1,084	10,762
1941	4,569	5,000	920	10,489
1940	4,247	3,625	1,072	8,944
1939	4,006	4,000	974	8,980
1938	3,623	4,038	604	8,265
1937	2,861	3,718	639	7,218
1936	3,422	....	742	4,164
1935	3,045	....	683	3,728
1934	2,608	....	641	3,249
1933	2,127	....	730	2,857
1932	2,532	....	694	3,226
1931	2,890	....	636	3,526
1930	2,961	....	671	3,632
1929	2,934	....	691	3,625
1928	2,896	....	671	3,567
1927	2,813	....	787	3,600
1926	2,804	....	788	3,592
1925	2,877	....	689	3,566
1924	2,866	....	683	3,549
1923	2,926	....	703	3,629
1922	3,196	....	754	3,950
1921	3,907	....	815	4,722
1920	4,079	....	955	5,034
1919	3,260	....	786	4,046
1918	2,726	....	642	3,368
1917	2,371	....	605	2,976
1916	2,073	....	649	2,722
1915	1,946	....	614	2,560
1914	2,021	....	626	2,647
1913	1,996	....	665	2,661
1912	1,770	....	635	2,405
1911	1,762	....	556	2,318
1910	1,562	....	554	2,116
1909	1,483	....	482	1,965
1908	1,587	....	505	2,092
1907	1,539	....	538	2,077
1906	1,454	....	438	1,892
1905	1,494	....	424	1,918
1904	1,676	....	391	2,067
1903	1,466	....	358	1,824

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*Estimated by STEEL.
n.a.=not available.
U.S. Department of Labor.

Labor Turn-Over

Rates Per 100 Employees in Manufacturing Industries

SEPARATIONS

	Quit		Discharge		Lay-Off		Miscellaneous		Total	
	1956	1955	1956	1955	1956	1955	1956	1955	1956	1955
Jan.	1.4	1.0	0.3	0.2	1.7	1.5	0.2	0.3	3.6	2.9
Feb.	1.3	1.0	0.3	0.2	1.8	1.1	0.2	0.2	3.6	2.5
Mar.	1.4	1.3	0.3	0.2	1.6	1.3	0.2	0.2	3.5	3.0
Apr.	1.5	1.5	0.3	0.3	1.4	1.2	0.2	0.2	3.4	3.1
May	1.6	1.5	0.3	0.3	1.6	1.1	0.2	0.2	3.7	3.2
June	1.6	1.5	0.3	0.3	1.3	1.2	0.2	0.2	3.4	3.2
July	1.5	1.6	0.2	0.3	1.2	1.3	0.2	0.2	3.2	3.4
Aug. ...	2.2	2.2	0.3	0.3	1.2	1.3	0.2	0.2	3.9	4.0
Sept. ...	2.6	2.8	0.3	0.3	1.4	1.1	0.2	0.2	4.4	4.4
Oct.	1.7	1.8	0.3	0.3	1.2	1.2	0.2	0.2	3.4	3.5
Nov.	..	1.4	..	0.3	..	1.2	..	0.2	..	3.1
Dec.	..	1.1	..	0.2	..	1.4	..	0.2	..	3.0

ACCESSIONS

	1956	1955		1956	1955		1956	1955
Jan.	3.3	3.3	May	3.4	3.8	Sept.	4.1	4.4
Feb.	3.1	3.2	June	4.2	4.3	Oct.	3.7	4.1
Mar.	3.1	3.6	July	3.3	3.4	Nov.	..	3.3
Apr.	3.3	3.5	Aug.	3.8	4.5	Dec.	..	2.5

U.S. Department of Labor.

Wages and Hours in Selected Industries

(Production Workers)

Stamped and Pressed Metal Products

	EARNINGS (Hourly Avg.)		HOURS (Weekly Avg.)	
	1956	1955	1956	1955
Jan.	$2.11	$2.09	40.4	42.8
Feb.	2.14	2.09	40.9	42.7
Mar.	2.16	2.09	41.3	42.8
Apr.	2.15	2.08	41.1	42.2
May	2.16	2.10	40.2	42.8
June	2.20	2.08	41.3	41.1
July	2.21	2.15	41.2	42.3
Aug.	2.20	2.12	41.1	42.0
Sept. ...	...	2.11	...	41.5
Oct.	...	2.12	...	42.4
Nov.	...	2.15	...	42.7
Dec.	...	2.16	...	42.5

Metalworking Machinery

(Except Machine Tools)

	1956	1955	1956	1955
Jan.	$2.24	$2.08	43.9	41.0
Feb.	2.25	2.09	44.4	41.0
Mar.	2.24	2.09	44.0	41.3
Apr.	2.23	2.11	43.8	41.7
May	2.25	2.11	43.5	41.8
June	2.24	2.14	43.0	42.4
July	2.26	2.16	42.8	42.1
Aug.	2.25	2.19	42.1	42.9
Sept. ...	...	2.21	...	43.2
Oct.	...	2.23	...	43.9
Nov.	...	2.23	...	43.8
Dec.	...	2.24	...	44.6

Machine Tools

	1956	1955	1956	1955
Jan.	$2.29	$2.10	46.2	41.8
Feb.	2.28	2.11	46.4	42.0
Mar.	2.27	2.13	45.9	42.4
Apr.	2.29	2.13	46.2	43.1
May	2.30	2.16	46.0	44.0
June	2.30	2.18	45.4	44.8
July	2.29	2.17	45.1	43.5
Aug.	2.31	2.18	44.8	44.1
Sept. ...	...	2.19	...	42.8
Oct.	...	2.21	...	45.4
Nov.	...	2.25	...	43.7
Dec.	...	2.28	...	46.6

Fabricated Structural Metal Products

	1956	1955	1956	1955
Jan.	$2.08	$1.95	41.5	40.3
Feb.	2.07	1.95	41.3	40.1
Mar.	2.07	1.95	41.3	40.6
Apr.	2.08	1.96	41.8	40.8
May	2.09	1.97	41.7	41.4
June	2.10	1.99	41.9	41.9
July	2.09	2.03	41.1	41.2
Aug.	2.13	2.03	40.2	41.7
Sept. ...	...	2.06	...	41.9
Oct.	...	2.07	...	42.0
Nov.	...	2.06	...	41.6
Dec.	...	2.06	...	41.7

Agricultural Machinery and Tractors

	EARNINGS (Hourly Avg.)		HOURS (Weekly Avg.)	
	1956	1955	1956	1955
Jan.	$2.16	$2.03	40.8	40.4
Feb.	2.15	2.04	40.6	40.6
Mar.	2.14	2.05	40.5	41.0
Apr.	2.14	2.05	40.0	40.7
May	2.13	2.05	39.9	40.7
June	2.14	2.04	40.0	40.7
July	2.15	2.03	39.9	40.0
Aug.	2.18	2.06	39.7	40.1
Sept. ...	...	2.06	...	40.3
Oct.	...	2.13	...	40.6
Nov.	...	2.12	...	40.5
Dec.	...	2.14	...	40.9

Automobiles

	1956	1955	1956	1955
Jan.	$2.28	$2.25	39.9	43.0
Feb.	2.28	2.26	38.4	43.8
Mar.	2.27	2.27	39.5	44.3
Apr.	2.28	2.25	39.9	43.5
May	2.28	2.28	37.6	44.3
June	2.31	2.23	38.3	40.0
July	2.33	2.30	39.9	42.5
Aug.	2.34	2.30	39.6	41.5
Sept. ...	...	2.33	...	41.3
Oct.	...	2.34	...	41.9
Nov.	...	2.38	...	44.1
Dec.	...	2.33	...	42.1

Aircraft and Parts

	1956	1955	1956	1955
Jan.	$2.21	$2.14	42.0	41.5
Feb.	2.21	2.14	42.0	41.1
Mar.	2.22	2.14	41.7	41.3
Apr.	2.25	2.14	41.7	40.7
May	2.26	2.15	41.8	41.0
June	2.27	2.15	41.7	41.0
July	2.29	2.17	41.9	41.2
Aug.	2.30	2.17	42.3	41.0
Sept. ...	...	2.19	...	41.4
Oct.	...	2.20	...	41.5
Nov.	...	2.20	...	41.6
Dec.	...	2.21	...	42.2

Gray Iron Foundries

	1956	1955	1956	1955
Jan.	$2.04	$1.93	40.8	40.6
Feb.	2.03	1.95	41.0	41.6
Mar.	2.04	1.96	41.0	41.6
Apr.	2.04	1.98	41.7	42.2
May	2.03	1.99	40.7	43.1
June	2.04	1.97	40.4	42.0
July	2.05	2.01	40.2	41.5
Aug.	2.06	1.99	40.8	41.5
Sept. ...	...	2.02	...	42.3
Oct.	...	2.06	...	42.7
Nov.	...	2.06	...	42.7
Dec.	...	2.04	...	42.1

U.S. Department of Labor.

Trade

METALWORKING FACTS AND FIGURES

1956-1955 By Months

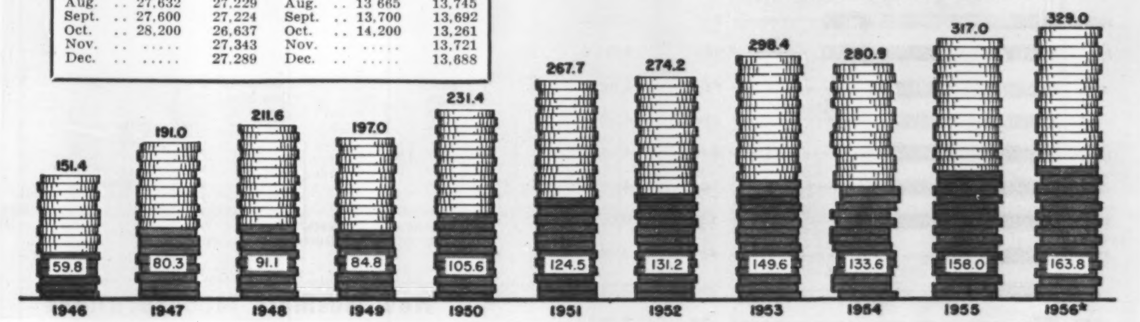
Millions of Dollars, Seasonally Adjusted

	All Manufacturing Industries				Durable Goods Industries	
	1956	1955			1956	1955
Jan.	.. 27,023	24,287	Jan.	..	13,595	11,850
Feb.	.. 27,224	24,649	Feb.	..	13,593	12,029
Mar.	.. 27 095	25,976	Mar.	..	13,294	12,860
Apr.	.. 27,231	26,025	Apr.	..	13,519	12,805
May	.. 27,814	26,651	May	..	13,754	13,322
June	.. 27,651	27,111	June	..	13,850	13,527
July	.. 26,158	26,731	July	..	12,627	13,503
Aug.	.. 27,632	27,229	Aug.	..	13 665	13,745
Sept.	.. 27,600	27,224	Sept.	..	13,700	13,692
Oct.	.. 28,200	26,637	Oct.	..	14,200	13,261
Nov.	.. ..	27,343	Nov.	..	.....	13,721
Dec.	.. ..	27,289	Dec.	..	.....	13,688

ANNUAL SALES TOTALS

(BILLIONS OF DOLLARS—NOT ADJUSTED FOR SEASONAL VARIATION)

Entire Bar=All Manufacturing Industries
Shaded Area=Durable Goods Industries
*Estimated.
U.S. Office of Business Economics



Inventories at End of Month

Millions of Dollars. Seasonally Adjusted

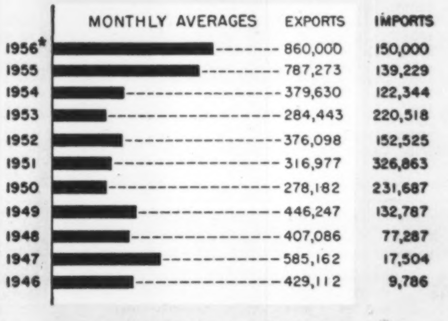
	All Manufacturing Industries		Durable Goods Industries	
	1956	1955	1956	1955
January	46,299	43,196	26,590	23,984
February	46,897	43,256	27,009	24,028
March	47 433	43,332	27,432	24,112
April	47,958	43,264	27,723	24,159
May	48,566	43,549	28,123	24,304
June	49,080	43,779	28,174	24,457
July	49,238	43,938	28 179	24,563
August	49,535	44,315	28,178	24,768
September	50,100	44,703	28,700	25,182
October	50,700	45,356	29,300	25,659
November	.....	45,669	.....	26,050
December	.....	45 923	.....	26,317

U.S. Office of Business Economics.

IRON & STEEL PRODUCTS

Exports and Imports

Excluding Advanced Manufactures—Net Tons



1956-1955 By Months

	Exports		Imports	
	1956	1955	1956	1955
January	789,500	631,371	144,677	104,236
February	905 604	665,436	130,872	112,932
March	906,220	776,906	134,967	109,723
April	918,899	769,679	141,592	116,948
May	934,168	865,671	177,902	138,216
June	903,649	868,720	162 642	132,644
July	676,112	826,773	168,776	103,978
August	621,587	688,745	225,355	184,286
September	......	790,381	......	169,872
October	......	842,685	......	171,430
November	......	816,832	......	160,077
December	......	904 080	......	166,401

U.S. Office of Business Economics. *Estimated.

Manufacturers' New Orders

Value—Millions of Dollars. Adjusted for Seasonal Variation

1956	Total Durables	Primary Metals	Fab. Metal Products	Mchy.	Transptn. Equip.	Other† Durables	Total Durables 1955	Total Durables 1954	Total Durables 1953
Jan.	14,683	2,387	1,398	3,806	4,191	2,901	12,142	9,376	12,884
Feb.	14,107	2,737	1,520	3,953	3,011	2 886	12,170	9,394	12,069
Mar.	13,337	2,333	1,373	3,877	2,884	2,870	13,353	9,585	11,919
Apr.	14 073	2,146	1,577	4,122	3,188	3,040	12,879	9,619	12,232
May	14,732	2,392	1,538	4,460	3,213	3,129	14,331	9,588	12,472
June	14,185	2,319	1,334	4,311	3,202	3 019	14,033	9,822	12,225
July	13,513	2,166	1,366	4,140	3,001	2,840	13,571	9,407	11,497
Aug.	15 166	2,322	1,346	4,195	4,402	2,901	15,145	9,756	10,038
Sept. ...	14,377	2,232	1,534	4,186	3,555	2,870	14,936	11,153	9,650
Oct.	14,500	....	....	....	....	....	14,094	10,790	9,527
Nov.	.....	....	....	....	....	....	14,680	10,491	9 098
Dec.	.....	....	....	....	....	....	15.605	11,963	9,253

† Includes ordnance, professional and scientific instruments, lumber, furniture, stone, clay and glass and miscellaneous industries.
U.S. Office of Business Economics.

Foreign Trade

Value—Millions of Dollars

	Exports			Imports		
	1956	1955	1954	1956	1955	1954
Jan.	1,279.8	1,165.6	1,091.5	1,074.3	870.3	833.7
Feb.	1,358.6	1,237.4	1,182.6	1,050.2	849.8	808.7
Mar.	1,578.3	1,343.2	1,125.2	1,102.0	1,019.2	861.8
Apr.	1,509.9	1,262.3	1,425.6	989.9	870.4	957.3
May	1,699.9	1,322.0	1,400.2	1,090.0	958.3	829.0
June	1,687.4	1,318.6	1,473.4	1,032.4	936.1	946.4
July	1,612.8	1,267.5	1,290.9	1,050 9	885.0	821.7
Aug.	1,516.8	1,236.3	1,155.7	1,049.1	960.3	824.7
Sept.	1,518.0	1,255.7	1,114.1	992.0	946.1	780.5
Oct.	.....	1,396.1	1,265.0	.....	1,010.7	763.3
Nov.	.....	1,321.6	1,249.2	.....	1,064.6	839.5
Dec.	.....	1,404.9	1,318.2	.....	1,007.8	942.3

U.S. Bureau of the Census.

Monthly Averages

	Exports	Imports
1956*	1,530	1,050
1955	1,294	948
1954	1,258	851
1953	1,313	906
1952	1,264	893
1951	1,253	914
1950	856	738
1949	1,004	552
1948	1,054	594
1947	1,278	480
1946	812	412
1945	817	347
1944	1,188	327

*Estimated.

Iron and Steel Scrap

(Net Tons)

	Exports		Imports	
	1956	1955	1956	1955
Jan.	416,614	368 280	16,410	11,124
Feb.	529,847	357,655	13,980	24,923
Mar.	479,517	419,621	13,263	11,524
Apr.	481,566	372,374	11,576	13,302
May	500,966	495 013	13,914	9,836
June	520,391	531,174	14,492	13,041
July	413,952	448,279	13,102	11,777
Aug.	383,481	344 075	26,907	27,120
Sept.	....	422,557	.....	25,887
Oct.	....	447,506	.....	17 061
Nov.	....	447,365	.....	15,508
Dec.	....	481,070	.....	15,268

U.S. Office of Business Economics.

Monthly Averages

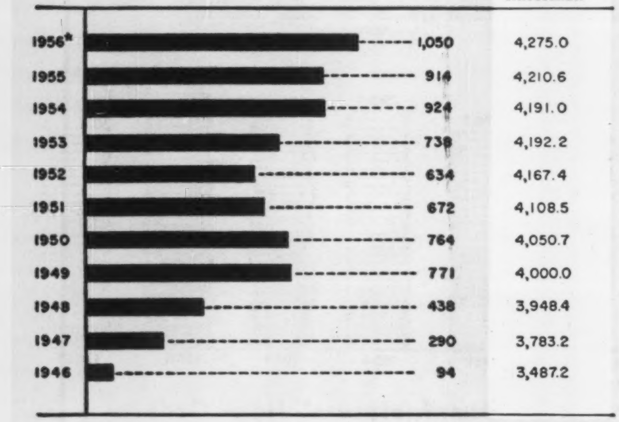
	Exports	Imports
1956* ..	475,000	14,000
1955 ...	427,914	16,364
1954 ...	125,609	17,195
1953 ...	25,310	10 964
1952 ...	28,464	8,825
1951 ...	19,228	29,925
1950 ...	18,080	61,483
1949 ...	24,883	91,994
1948 ...	20,308	36,226
1947 ...	16,173	3,016
1946 ...	12,424	2 519
1945 ...	7,978	3,856
1944 ...	7,973	9,070

* Estimated.

Trade

BUSINESS FAILURES

Total Monthly Averages



Failures—Liabilities

	FAILURES			LIABILITIES	
	Total	Con-struction	Mfg., Mining	Con-struction	Mfg., Mining
1956					
January	1,048	126	209	$6,163,000	$14,442,000
February	1,024	141	202	9,881,000	17,647,000
March	1,170	150	224	7,089,000	15,649,000
April	985	153	186	6,967,000	17,142,000
May	1,164	132	245	8,877,000	28,450,000
June	1,105	163	183	8,598,000	10,684,000
July	1,018	141	165	7,488,000	9,005,000
August	1,101	146	195	7,507,000	17,828,000
September	932	146	140	7,840,000	9,539,000
October	1,158	182	198	11,145,000	17,345,000
November	....	...	...	....	....
December	....	...	...	....	....
Monthly Averages					
1956*	1,070	...	...	....	....
1955	914	117	183	$6,931,583	$13,078,750
1954	924	109	190	4,735,750	14,273,667
1953	738	85	155	3,610,583	13,237,833
1952	634	70	132	3,012,083	8,746,167
1951	672	80	128	3,123,000	7,581,000
1950	764	76	173	2,138,000	7,925,000
1949	771	70	194	2,270,000	11,939,000
1948	438	37	123	1,301,000	10,858,000
1947	290	20	106	601,000	11,894,000
1946	94	12	39	362,000	3,241,000

Dun & Bradstreet Inc.

*Estimated.

Businesses in Operation

(In Thousands at Beginning of Half)

	Total	Contract Construction	Manufac-turing	Service
1956* (Avg.)	4,275.0	....	....	....
1st Half	4,252.0	475.0	308.0	746.0
2nd Half	.....	....	....	....
1955 (Avg.)	4,210.6	455.8	311.9	742.8
1st Half	4,189.0	446.1	312.5	740.6
2nd Half	4,232.3	465.6	311.4	745.0
YEARLY TOTALS				
1954	4,191.0	436.3	319.7	740.6
1953	4,192.2	425.0	326.7	740.4
1952	4,167.4	411.0	328.8	739.5
1951	4,108.5	388.6	327.2	735.5
1950	4,050.7	370.5	320.7	735.6
1949	4,000.0	347.5	320.5	736.8
1948	3,948.4	329.0	320.0	738.3
1947	3,783.2	292.6	312.0	711.5
1946	3,487.2	243.8	285.9	656.5
1945	3,113.9	176.8	258.4	591.5
1944	2,916.5	153.3	250.2	551.8
1943	2,905.1	157.2	244.9	553.6

*Estimated by STEEL.
U.S. Office of Business Economics.

New Business Incorporations

	1956	1955	1954	1953	1952
January	13,363	13,181	9,543	9,468	8,357
February	12,503	11,369	8,533	7,943	7,138
March	12,822	13,417	10,514	9,659	7,902
April	12,475	11,756	10,272	9,507	8,284
May	13,142	12,029	9,280	8,968	7,915
June	11,952	12,605	9,748	8,926	7,819
July	11,513	10,893	9,409	8,703	7,549
August	11,339	10,983	9,041	7,487	7,088
September	9,583	11,024	9,256	7,433	7,529
October	11,546	10,698	9,852	8,267	8,223
November	.....	10,157	9,735	7,269	6,741
December	.....	11,539	11,981	8,915	8,274
Total	.....	139,651	117,164	102,545	92,819
Monthly Avg.	11,935	11,638	9,764	8,545	7,735

Dun & Bradstreet Inc.

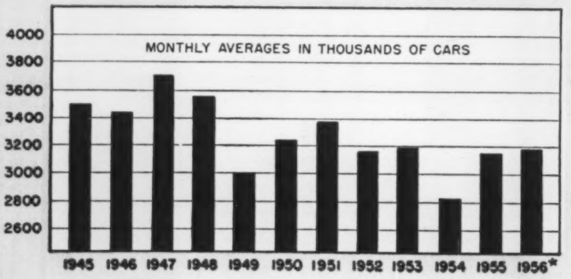
Discontinued Businesses

(Thousands)

	Total	Contract Construction	Manufac-turing	Service
1956*	330.0	...	...	...
1955	310.9	40.4	30.0	52.3
1954	330.6	46.8	32.1	51.6
1953	334.0	50.7	31.5	52.6
1952	306.3	45.5	29.1	50.8
1951	309.3	46.7	26.4	54.2
1950	289.6	39.2	24.7	57.8
1949	306.5	40.7	30.8	60.7

*Estimated by STEEL.
U.S. Office of Business Economics

FREIGHT CARLOADINGS



1956—By Weeks

Jan. 7	611,299	May 12	777,606	Sept. 8	679,611
Jan. 14	710,338	May 19	778,997	Sept. 15	820,666
Jan. 21	699,286	May 26	788,297	Sept. 22	822,255
Jan. 28	691,850	June 2	719,209	Sept. 29	831,438
Feb. 4	680,989	June 9	787,075	Oct. 6	815,004
Feb. 11	684,328	June 16	801,431	Oct. 13	823,207
Feb. 18	698,319	June 23	799,461	Oct. 20	828,741
Feb. 25	687,018	June 30	755,292	Oct. 27	816,803
Mar. 3	710,996	July 7	478,297	Nov. 3	800,272
Mar. 10	697,601	July 14	619,988	Nov. 10	772,761
Mar. 17	685,985	July 21	648,492	Nov. 17	763,876
Mar. 24	697,248	July 28	649,806	Nov. 24	650,920
Mar. 31	724,944	Aug. 4	660,287	Dec. 1	752,150
Apr. 7	685,397	Aug. 11	715,236	Dec. 8	......
Apr. 14	742,053	Aug. 18	769,624	Dec. 15	......
Apr. 21	763,437	Aug. 25	770,413	Dec. 22	......
Apr. 28	778,398	Sept. 1	784,366	Dec. 29	......
May 5	770,558				

Association of American Railroads.

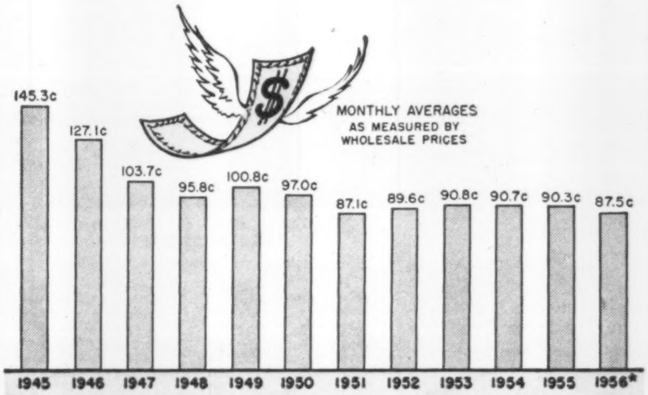
*Estimated.

Finance

METALWORKING FACTS AND FIGURES

PURCHASING POWER OF THE DOLLAR

(1947-1949=100)



AS MEASURED BY:

	Wholesale Prices	Consumers' Prices	Retail Food Prices
1956*			
Jan.	89.4	87.3	91.6
Feb.	89.0	87.3	91.9
Mar.	88.7	87.2	91.7
Apr.	88.0	87.0	91.2
May	87.4	86.7	90.1
June	87.6	86.1	88.3
July	87.7	85.5	87.1
Aug.	87.2	85.6	88.4
Sept.	86.6	85.4	88.4
Oct.	86.6	85.0	88.4
Monthly Averages			
1955	90.3	87.3	90.2
1954	90.7	87.1	88.8
1953	90.8	87.4	88.7
1952	89.6	88.1	87.3
1951	87.1	90.1	88.8
1950	97.0	97.3	98.8
1949	100.8	98.2	100.0
1948	95.8	97.3	96.1
1947	103.7	104.7	104.3
1946	127.1	119.9	126.6

*Estimated.
U.S. Office of Business Economics.

National Income

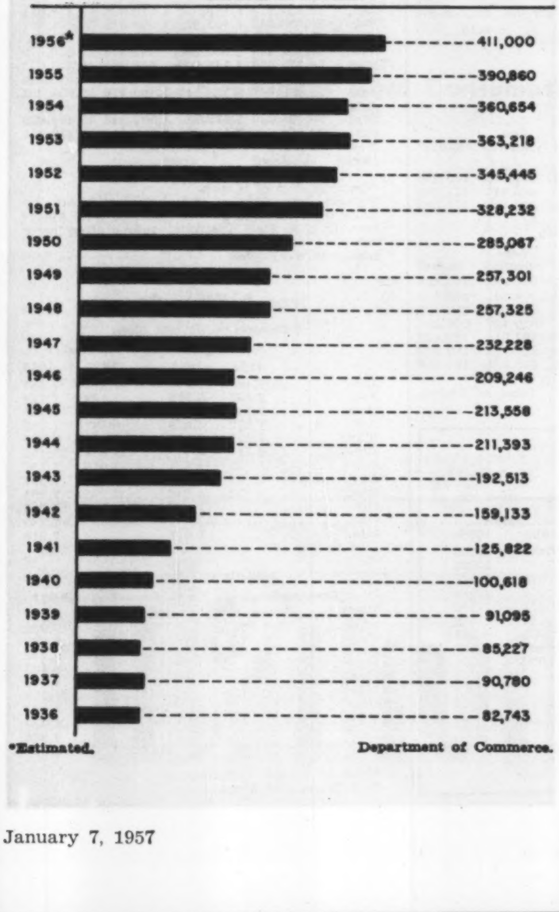
(Millions of Dollars)

1956*.	340,500
1955..	324,048
1954..	298,335
1953..	302,129
1952..	290,177
1951..	277,041
1950..	239,956
1949..	216,193
1948..	221,641
1947..	197,168
1946..	179,577
1945..	181,248
1944..	182,639
1943..	170,310
1942..	137,694
1941..	104,710
1940...	81,634
1939..	72,753
1938..	67,581
1937..	73,618
1936..	64,911
1935..	57,057

*Estimated.
Dept. of Com.

GROSS NATIONAL PRODUCT OR EXPENDITURE

(Millions of Dollars)



*Estimated.

Department of Commerce.

U.S. Revenues, Expenditures, Debt

Year	Net Receipts 000,000	Per Capita Receipts	Expenditures 000,000	Per Capita Expenditures	Gross Debt 000,000	Per Capita Debt
1956....	$68,140	$405.94	$66,385	$395.48	$272,751	$1624.89
1955....	60,389	365.89	64,568	391.21	274,374	1662.41
1954....	64,356	396.80	68,131	420.08	271,260	1672.51
1953....	65,219	408.97	74,608	467.84	266,071	1668.44
1952....	62,129	396.31	66,146	421.93	259,105	1652.77
1951....	48,142	312.36	44,632	289.59	255,222	1655.97
1950....	37,043	244.42	40,167	265.03	257,357	1698.13
1949....	38,246	256.68	40,057	268.83	252,770	1696.44
1948....	44,746	306.24	36,326	248.61	252,292	1726.68
1947....	44,703	311.77	42,505	296.44	258,376	1801.94
1946....	43,037	305.25	65,018	461.17	269,422	1910.97
1945....	46,456	332.78	100,404	719.25	258,682	1853.01
1944....	44,149	319.92	93,743	679.29	201,003	1455.52
1943....	22,281	163.25	78,182	572.83	136,696	1001.55
1942....	12,799	95.25	32,491	241.80	72,422	537.35
1941....	7,607	57.29	12,774	74.16	48,961	367.54
1940....	5,387	44.09	9,127	70.65	42,967	325.63
1939....	5,164	43.21	8,765	70.65	40,445	308.34
1938....	5,854	47.89	7,304	59.70	37,167	285.43
1937....	5,028	40.93	8,281	62.69	36,427	281.82
1936....	4,115	32.17	9,068	69.41	33,545	261.20
1935....	3,800	29.88	7,583	58.00	28,701	225.07
1934....	3,115	24.64	6,370	56.19	27,053	213.65
1933....	2,079	16.54	4,325	40.91	22,538	179.21
1932....	2,005	16.06	4,948	41.28	19,487	155.93
1931....	3,190	25.70	4,091	32.99	16,801	135.37
1930....	4,177	33.01	3,994	32.42	16,185	131.49
1929....	4,033	33.19	3,848	31.67	16,931	139.40
1928....	4,042	33.73	3,643	30.40	17,604	146.69
1927....	4,129	34.94	3,493	29.56	18,510	156.04
1926....	3,962	33.98	3,584	30.76	19,643	167.70
1925....	3,780	32.91	3,529	30.73	20,516	177.82
1924....	4,012	35.44	3,507	30.98	21,251	186.86
1923....	4,007	35.93	3,697	33.15	22,349	200.10
1922....	4,109	37.40	3,795	34.54	22,964	208.97
1921....	5,625	51.98	5,538	51.18	23,976	221.09

Annual Statements of the Treasury.

Corporate Income, Taxes, Dividends

(All Industries—Millions of Dollars)

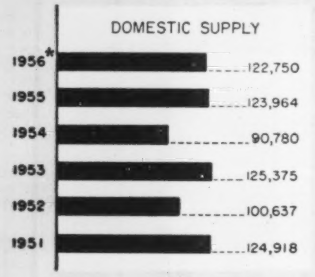
	Income Before Taxes	Taxes†	Income After Taxes	Dividend Payments	Undistributed Income
1956					
1st Qtr. ...	43,700§	22,100§	21,600§	1,667	.....
2nd Qtr. ...	42,900§	21,600§	21,300§	1,727	.....
1955	42,666	21,533	21,133	11,218	9,915
1954	33,203	16,775	16,428	10,045	6,383
1953	37,039	20,304	16,735	9,310	7,425
1952	35,936	19,788	16,148	9,000	7,148
1951	41,173	22,476	18,697	9,090	9,607
1950	39,970	17,829	22,141	9,207	12,934
1949	26,198	10,411	15,787	7,458	8,329
1948	32,769	12,510	20,259	7,248	13,011

†Federal and state corporate income and excess profits tax liability.
§Seasonally adjusted quarterly totals at annual rates.
Department of Commerce.

Fuel-Power-Raw Materials

IRON ORE SUPPLY (exclusive of stocks on hand)

(Thousands of Gross Tons)



1956	U.S. Mine Production	Imports	Exports	Total Domestic Supply
Jan.	3.279	1,460	94	4,645
Feb.	3,592	1,484	57	5,019
Mar.	3,649	1,397	62	4,984
Apr.	8,084	1,600	318	9,366
May	12,970	2,989	752	15,207
June	13.233	3,081	741	15,573
July	1,490	2,651	337	3,804
Aug.	9,962	4,068	644	13,386
Sept.	13,404	....	...	.....
Oct.	.....	....	...	.....
Nov.	.....	....	...	.....
Dec.	.....	....	...	.....

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*Estimated.
Lake Superior Iron Ore Association.

Coke Production

Net Tons

	Oven	Beehive	Total
1956*	....	....	74,550,000
Jan.	6,660,922	253,914	6,914,836
Feb.	6,234,670	241,465	6,476,135
Mar.	6,625,374	271,219	6,896,593
Apr.	6,379,919	253,444	6,633,363
May	6,467,080	258,316	6,725,396
June	6,019,849	215,842	6,235,691
July	2,252,651	48,791	2,301,442
Aug.	5,496,368	118,629	5,614,997
Sept.	6,291,970	167,319	6,459,289
Oct.	....	....	....
Nov.	....	....	....
Dec.	....	....	....
1955	73,455,250	1,703,579	75,158,829
Jan.	5,745,421	60,505	5,805,926
Feb.	5,326,969	63,773	5,390,742
Mar.	6,130,731	101,582	6,232,313
Apr.	6,013,542	117,374	6,130,916
May	6,286,982	134,934	6,421,916
June	6,000,707	154,035	6,154,742
July	6,038,615	144,918	6,183,533
Aug.	6,229,541	170,228	6,399,769
Sept.	6,234,149	162,984	6,397,133
Oct.	6,452,201	178,744	6,630,945
Nov.	6,356,571	189,291	6.545,862
Dec.	6,639,821	225,211	6,865,032

YEARLY TOTALS

	Oven	Beehive	Total
1956*	....	....	74,550,000
1955	73,455,250	1,703,579	75,158,829
1954	59,061,442	601,054	59,662,496
1953	73,593,528	5,243,329	78,836,857
1952	63,850,115	4,403,994	68,254,109
1951	71,987,172	7,343,530	79,330,702
1950	66,890,618	5,827,420	72,718,038
1949	60,222,481	3,414,948	63,637,429
1948	68,284,357	6,577,571	74,861,928

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*Estimated.
U.S. Bureau of Mines.

Lake Superior Iron Ore

Shipments from Upper Lake Ports

Gross Tons

	1956	1955	1954
Jan.	none	none	none
Feb.	none	none	none
Mar.	none	none	none
Apr.	5,674,112	3,758,006	1,524,702
May	12,553,857	11,605,747	9,951,556
June	12,939,316	12.595,259	10,608,262
July	2,665,548	13,334,308	11,016,010
Aug.	8,045,020	13,572,266	9,554,681
Sept.	12,745,097	12,756,566	7,951,317
Oct.	12,628,477	12,243,518	7,251,905
Nov.	8,801,168	7,409,793	2,917,620
Dec.	....	184,390	17,644
Total	....	87,459,853	60,793,697

Lake Superior Iron Ore Association.

Fluorspar

Net Tons

1956	Production	Imports	Consumption	Stocks†
1st Qtr.	60,890	100,388	158,176	149,886
2nd Qtr.	86,019	119,223	165,441	171,092
1st Half	146,909	219,611	323,617	171,092

YEARLY TOTALS

	Production	Imports	Consumption	Stocks†
1955	291,275	372,415	566,636	175,005
1954	247,700	293,320	478,641	170,183
1953	322,800	359,569	586,798	259,407
1952	345 400	352,503	520,197	279,657
1951	351,300	181,275	497,012	182,409
1950	283,500	164,634	426,121	183,723
1949	236,400	95,619	345,221	167,660

U.S. Bureau of Mines. †End of period.

Scrap Consumption by Industries

Thousands of Net Tons

	Makers of Steel Ingots and Castings[1]		Makers of Steel Castings[2]		Iron Foundries and Misc.		Total†	
	1956	1955	1956	1955	1956	1955	1956	1955
Jan.	6,073	4,889	316	216	1,102	962	7,492	6,066
Feb.	5,685	4,794	325	228	1,097	970	7,107	5,993
Mar.	6,110	5,623	336	382	1,095	1.167	7,541	7,071
Apr.	5,902	5,577	324	267	1,044	1.143	7,270	6,988
May	5,893	5,806	351	274	1,027	1.107	7,271	7,186
June	5,458	5,459	317	285	939	1,108	6,714	6,852
July	1,238	5,029	232	205	755	867	2,225	6,101
Aug.	4,827	5,299	324	287	958	1.036	6.108	6,623
Sept.	....	5,426	...	312	....	1,050	6,980	6,788
Oct.	....	5,796	...	304	....	1.116	....	7,217
Nov.	....	5,777	...	303	....	1.134	....	7,214
Dec.	....	5,865	...	315	....	1.036	....	7,276

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[1] Includes only those castings made by companies producing steel ingots.
[2] Excludes companies that produce both steel castings and steel ingots.
†Totals are not precise because of rounded figures.
U.S. Bureau of Mines.

Iron Ore Consumption†

(Thousands of gross tons)

United States

1956	United States	Canadian	Foreign	Total
Jan.	26,877	2.005	4,213	33,095
Feb.				
Mar.				
Apr.	8,520	666	1.377	10,563
May	8,865	736	1,272	10,873
June	7.997	863	1,224	.....
July	7.604	1,080	1.250	9,934
Aug.				
Sept. ...	8,263	1,011	1,665	10,939
Oct.	.....	....	....	.....
Nov.	.....	....	....	.....
Dec.	.....	....	....	.....

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†Includes ore agglomerates.
Lake Superior Iron Ore Association.

Refractories†

(Shipments in Thousands of Dollars)

	Clay Refractories	Nonclay Refractories	Total Refractories
1954	132,025	126,354	258,379
1953	159.663	164,704	324,367
1952	161,092	139,154	300,246
1951	171,086	155,756	326,842
1950	126,686	111,971	238,657
1949	102,144	82,027	184,171

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†Does not include dead-burned magnesia and magnesite or dead-burned dolomite.
U.S. Bureau of the Census.

Iron Ore Stocks†

(Lake Superior, Gross Tons)

1956	At U.S. Furnaces	At Lake Erie Docks	At Can. Furnaces	Total Stocks
Jan.	35,623,773	6,819,872	1,915,366	44,359,011
Feb.	28,689,643	6,418,829	1,593,375	36,701,847
Mar.	22,370,200	5,495,298	1,307,204	29,172,702
Apr.	19,384,448	2,655,293	980,378	23,020,119
May	16,375,075	2,188,960	808,838	19,372,873
June	20,351,004	2,561,598	1,097,644	24,010,246
July	26,008,007	3,366,540	1,460,476	30,835,023
Aug.	n.a.	n.a.	n.a.	n.a.
Sept.	30,098,015	3,573,763	1,802,845	35,474,623
Oct.	35,056,781	3,836,709	2,319,414	41,212,904
Nov.	....	....	....	....
Dec.	....	....	....	....

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†On first day of month.
Figures from April to date compiled jointly by Lake Superior Iron Ore Association and American Iron & Steel Institute, representing more complete data than prior reports.
n.a.=not available.

Iron & Steel Scrap

Thousands of Net Tons

	Consumption		Stocks†	
	1956	1955	1956	1955
Jan.	7,492	6,066	7,141	7,284
Feb.	7,107	5,993	7,168	7,156
Mar.	7,541	7,071	6,863	7,158
Apr.	7,270	6,988	6,737	7,243
May	7,271	7,186	7,054	7,259
June	6,714	6,852	6,934	7,184
July	2,225	6,101	7,013	7,132
Aug.	6,108	6,623	7,027	7,357
Sept.	6,980	6,788	6,785	7,355
Oct.	....	2,217	....	7,385
Nov.	....	7,214	....	7,385
Dec.	....	7,276	....	7,210

MONTHLY AVERAGES

Consumption		Consumers' Stocks†	
1956*.......	6,660	1956*.......	7,000
1955........	6,781	1955........	7,259
1954........	5,113	1954........	6,689
1953........	6.442	1953........	6,737
1952........	5,752	1952........	6,103
1951........	6,395	1951........	4,472
1950........	5,742	1950........	5,272
1949........	4,528	1949........	5,631
1948........	5,414	1948........	4,980
1947........	5,072	1947........	3,966
1946........	4,124	1946........	3,757

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†End of month. *Estimated.
U.S. Bureau of Mines.

Fuel-Power-Raw Materials

METALWORKING FACTS AND FIGURES

U. S. Electricity Production Capacity

Thousands of Kilowatts

1956			
January	114,548	July	117,538
February	115,591	August	118,011
March	116,558	September	118,611
April	116,777	October	......
May	117,433	November	......
June	117,502	December	......

CAPACITIES AT YEAR END

1955	114,371	1951	75,775	1947	52,322
1954	102,592	1950	68,919	1946	50,317
1953	91,502	1949	63,100	1945	50,111
1952	82,226	1948	56,560	1944	49,189

Edison Electric Institute.

Liquid Petroleum Gas Consumption in Steel Industry

Gallons

	Heating and Annealing	All Other	Total
1955	10,705,474	1,595,174	12,300,648
1954	6,700,742	874,980	7,575,722
1953	8,473,351	1,647,095	10,120,446

American Iron & Steel Institute.

Fuel Oil Consumption in Steel Industry

Thousands of Gallons

	Melting Furnaces	Heating, Annealing, etc.	Total
1955	1,584,752	693,090	2,277,842
1954	1,239,305	558,989	1,798,294
1953	1,708,471	684,745	2,393,216
1952	1,579,960	660,165	2,240,125
1951	1,781,660	742,050	2,523,710
1950	1,618,723	675,481	2,294,204
1949	1,272,367	562,930	1,835,297

American Iron & Steel Institute.

ELECTRICITY OUTPUT

By Plants Contributing to Public Supply
Millions of Kilowatt-hours

1956—By Weeks

Jan. 7	11,057	May 5	10,815	Sept. 1	11,565
Jan. 14	11,594	May 12	10,837	Sept. 8	10,955
Jan. 21	11,521	May 19	10,875	Sept. 15	11,339
Jan. 28	11,512	May 26	10,927	Sept. 22	11,482
Feb. 4	11,540	June 2	10,598	Sept. 29	11,365
Feb. 11	11,343	June 9	10,951	Oct. 6	11,342
Feb. 18	11,321	June 16	11,425	Oct. 13	11,300
Feb. 25	11,277	June 23	11,478	Oct. 20	11,333
Mar. 3	11,199	June 30	11,498	Oct. 27	11,391
Mar. 10	11,133	July 7	10,391	Nov. 3	11,487
Mar. 17	11,202	July 14	10,878	Nov. 10	11,522
Mar. 24	11,134	July 21	11,125	Nov. 17	11,589
Mar. 31	10,992	July 28	11,295	Nov. 24	11,439
Apr. 7	10,846	Aug. 4	11,190	Dec. 1	12,075
Apr. 14	10,918	Aug. 11	11,530	Dec. 8	.....
Apr. 21	10,894	Aug. 18	11,794	Dec. 15	.....
Apr. 28	10,867	Aug. 25	11,340	Dec. 22	.....
				Dec. 29	.....

Edison Electric Institute and Federal Power Commission.

YEARLY TOTALS

Millions of Kilowatt-hours

1956*	600,500
1955	546,404
1954	471,686
1953	442,665
1952	399,224
1951	370,673
1950	329,141
1949	291,100
1948	282,698
1947	255,739
1946	223,178
1945	222,486
1944	228,189

*Estimated.

Industrial Coal Stocks

(Bituminous)
Thousands of Net Tons at End of Month

	1956	1955		1956	1955
Jan.	64,852	65,166	July	70,411	66,845
Feb.	64,394	63,130	Aug.	73,152	69,701
Mar.	65,194	63 022	Sept.	74,953	70,443
Apr.	66,536	63,270	Oct.	......	70.516
May	70,965	65,471	Nov.	......	69,211
June	72,695	68,310	Dec.	......	67,425

U.S. Bureau of Mines.

Natural Gas Consumption in Steel Industry

Millions of Cubic Feet

	Melting Furnaces	Heating, Annealing	All Other	Total
1955	55,354	161,157	80,551	297,062
1954	40,302	194,888	44,869	280,059
1953	44,765	139,339	39,794	223,898
1952	40,096	125,842	43,051	208,989
1951	44,669	126,380	35,748	206,797
1950	44,398	128,205	31,249	203,852
1949	36,542	96,319	30,180	163,041
1948	39,503	99,666	28,078	167,247
1947	34,708	90,220	24,008	148,936

American Iron & Steel Institute.

Bituminous Coal Consumption

Thousands of Net Tons

	Industrial Consumption		Retail Deliveries		Total	
	1956	1955	1956	1955	1956	1955
Jan.	37,592	30,101	7,881	6,233	45,473	36,334
Feb.	34,231	27,916	6,990	5,853	41,221	33,769
Mar.	35,124	30,243	5,997	4,862	41,121	35,105
Apr.	31,900	28,368	4,186	2,839	36,086	31,207
May	31,499	29,123	2,976	2,355	34,475	31,478
June	29,862	28,716	2,005	2,640	31,867	31,356
July	22,649	29,083	1,951	2,358	24,600	31,441
Aug.	29,557	30,831	2,802	3,400	32,359	34,231
Sept.	30,144	30,539	3,195	4,311	33,339	34.850
Oct.	.....	32,713	....	4,820	.....	37,533
Nov.	.....	34,387	....	6,194	.....	40,581
Dec.	.....	37,506	....	7,897	.....	45,403

U.S. Office of Business Economics.

Monthly Averages

	Industrial Consumption	Retail Deliveries	Total
1955	30,793	4,481	35,274
1954	25,829	4,384	30,213
1953	30,365	5,108	35,473
1952	29,128	5,699	34,827
1951	32,624	6,378	39,001
1950	30,573	7,217	37,790
1949	29,530	7,525	37,055
1948	35,759	7,479	43,238
1947	37,087	8,264	45,350

U.S. Bureau of Mines.

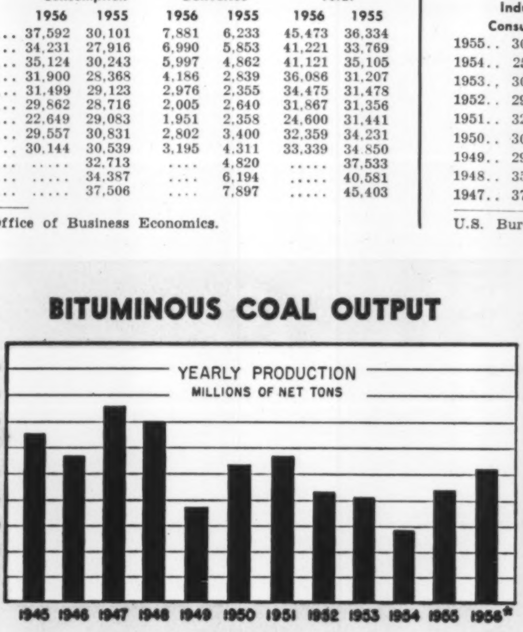
Natural Gas Sales

Millions of Therms

	Residential	Industrial, Commercial	Other	Total
1956				
1st Qtr.	9,774	11,188	616	21,578
2nd Qtr.	4,945	10,762	496	16,203
3rd Qtr.	....	....	....	....
4th Qtr.	....	....	....	....
1955				
1st Qtr.	8,715	10,159	691	19,565
2nd Qtr.	3,931	9,602	688	14,221
3rd Qtr.	1,758	9,756	790	12,304
4th Qtr.	5,562	10,321	796	16,679

American Gas Association.

BITUMINOUS COAL OUTPUT



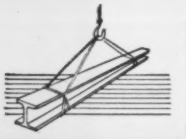
1956—By Weeks

Thousands of Net Tons

Jan. 7	9,270	May 5	9,990	Sept. 1	9,990
Jan. 14	10,635	May 12	10,020	Sept. 8	8,730
Jan. 21	10,540	May 19	9,800	Sept. 15	10,650
Jan. 28	10,420	May 26	10,120	Sept. 22	10,100
Feb. 4	9,755	June 2	8,820	Sept. 29	10,510
Feb. 11	10,150	June 9	9,850	Oct. 6	10,410
Feb. 18	10,050	June 16	10,280	Oct. 13	10,230
Feb. 25	9,970	June 23	10,290	Oct. 20	10,540
Mar. 3	9,880	June 30	7,300	Oct. 27	10,440
Mar. 10	9,525	July 7	1,290	Nov. 3	10,590
Mar. 17	9,230	July 14	7,250	Nov. 10	10,165
Mar. 24	9,930	July 21	9,000	Nov. 17	10,420
Mar. 31	10,280	July 28	9,030	Nov. 24	9,135
Apr. 7	8,595	Aug. 4	9,240	Dec. 1	....
Apr. 14	10,050	Aug. 11	9,500	Dec. 8	....
Apr. 21	9,900	Aug. 18	9,880	Dec. 15	....
Apr. 28	10,160	Aug. 25	9,950	Dec. 22	....
				Dec. 29	....

U. S. Bureau of the Census.

*Estimated.



Construction

METALWORKING FACTS AND FIGURES

CONSTRUCTION VALUATION

37 Eastern States—Thousands of Dollars

	Total		Public Works, Utilities		Residential and Nonresidential	
	1956	1955	1956	1955	1956	1955
Jan.	1,858,228	1,504,450	502,561	249,307	1,355,667	1,255,143
Feb.	1,859,737	1,581,143	430,412	302,578	1,429,325	1,278,565
Mar.	2,381,907	2,134,819	395,431	386,219	1,986,476	1,748,600
Apr.	2,421,497	2,322,085	455,788	545,937	1,965,709	1,776,148
May	2,479,775	2,185,065	531,092	448,000	1,948,683	1,737,065
June	2,197,815	2,255,209	577,325	461,487	1,620,490	1,793,722
July	2,148,559	2,271,537	543,308	419,888	1,605,251	1,851,649
Aug.	2,068,754	1,894,841	447,734	377,960	1,621,020	1,516,881
Sept.	2,024,794	2,034,895	485,108	592,710	1,539,686	1,442,185
Oct.	1,706,406	1,862,692	374,528	387,913	1,331,878	1,474,779
Nov.	....	1,796,787	......	408,467	....	1,388,320
Dec.	....	1,920,754	......	482,723	....	1,438,031
Total	24,450,000*	23,764,277	......	5,063,189	....	18,701,088

F. W. Dodge Corp.

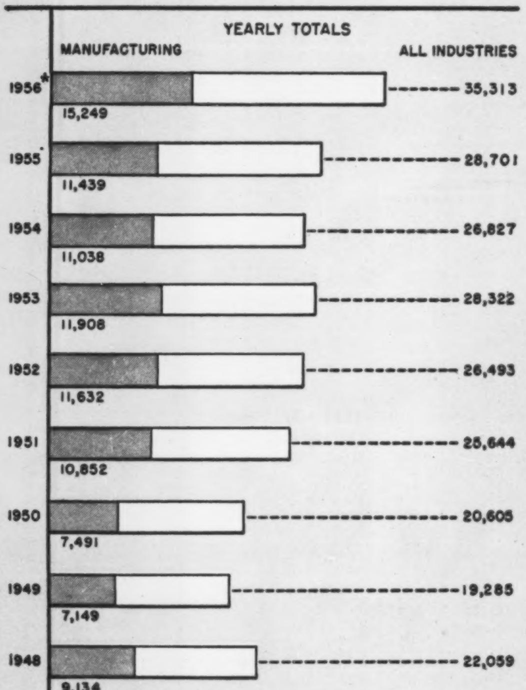
*Estimated.

NEW PLANT AND EQUIPMENT EXPENDITURES

Millions of Dollars

(Figures do not necessarily add to totals, due to rounding.)

	Manufacturing		All Industries	
	1956	1955	1956	1955
1st Quarter	2,958	2.249	7,462	5,847
2nd Quarter	3,734	2,795	8,880	7,009
3rd Quarter	4,270	2,899	9,587	7,449
4th Quarter	4,287	3,499	9,384	8,398
Total	15,249*	11,439	35,313*	28,701



*Estimated.

U.S. Office of Business Economics and Securities & Exchange Commission.

CONSTRUCTION PUT IN PLACE

(Millions of Dollars)

	TOTAL	PRIVATE Nonfarm Residential	PRIVATE Nonresidential	PRIVATE Farm	PRIVATE Public Utility	PRIVATE All Other	PUBLIC
1956 10 Mos.	36,825	12,669	7,236	1,307	4,218	99	11,296
Jan.	2,938	1,080	650	97	341	8	762
Feb.	2,811	998	647	101	334	7	724
Mar.	3,072	1,116	656	109	373	7	811
Apr.	3,389	1,212	664	121	398	8	986
May	3,714	1,270	704	139	427	10	1,164
June	4,008	1,362	759	150	448	11	1,278
July	4,231	1,445	787	159	462	12	1,366
Aug.	4,286	1,431	788	161	481	12	1,413
Sept.	4,250	1,105	788	148	480	12	1,417
Oct.	4,126	1,350	793	122	474	12	1,375
Nov.	.....	.....	....	....	....	...	.....
Dec.	.....	.....	....	....	....	...	.....
1955	42,991	16,595	7,612	1,600	4,604	161	12,419
1954	37,782	13,496	6,250	1,645	4,341	121	11,929

U.S. Departments of Commerce and Labor.

NEW HOUSES STARTED

(Permanent Nonfarm Dwelling—Cost Estimated in Thousands of Dollars)

	Number		Cost	
	1956	1955	1956	1955
January	75,000	87,600	$812,162	$892,794
February	78,300	89,900	885,855	954,570
March	98,600	113,800	1,149,101	1,228,834
April	111,300	132,000	1,308,933	1,434,395
May	113,700	137,600	1,346,513	1,502,901
June	107,400	134,500	1,268,496	1,478,989
July	101,000	122,700	1,182,078	1,372,150
August	101,000	124,700	1,189,505	1,369,948
September	93,000	114,900	1,097,998	1,283,343
October	93,000	105,800	....	1,178,809
November	.....	89,200	....	993,986
December	.....	76,200	....	853,928
Total	1,100,000*	1,328,900	....	$14,544,647

YEARLY TOTALS

	Number	Cost		Number	Cost
1956*	1,100,000*	....	1952	1,127,000	$10,208,983
1955	1,328,900	$14,544,647	1951	1,091,300	9,800,892
1954	1,220,400	12,478,237	1950	1,396,000	11,788,595
1953	1,103,800	10,488,003	1949	1,025,100	7,702,971

U.S. Bureau of Labor Statistics.

*Estimated.

FABRICATED STRUCTURAL STEEL

Tons

	Orders Placed			Shipments		
	1956	1955	1954	1956	1955	1954
January	405,396	241,373	177,760	251,498	225,827	245,629
February	331,497	233,885	266,594	285,380	213,386	253,119
March	365,517	285,434	193,509	306,760	227,789	285,365
April	378,937	270,226	184,982	289,616	242,337	293,532
May	358,271	303,343	199,383	306,223	222,991	253,886
June	337,230	318,150	219,306	284,719	282,325	290,262
July	288,166	369,414	262,782	165,470	219,444	265,181
August	268,273	312,338	193,081	213,495	268,362	272,479
September	245,617	339,461	206,606	240,858	289,128	265,388
October	290,961	308,780	213,497	287,639	283,768	258,447
November	......	345,308	195,550	......	258,883	228,704
December	......	367,827	196,767	......	248,017	223,533
Total	......	3,695,539	2,509,817	......	2,982,257	3,135,525

	Orders Placed	Shipments
1953	2,786,591	3,117,711
1952	2,503,521	2,664,255

American Institute of Steel Construction.

Industrial Building Cost Index

(1914=100)

	1956	1955	1954	1953	1952	1951
First Quarter	405	396	393	383	374	357
Second Quarter	421	397	393	385	383	373
Third Quarter	441	399	395	392	383	374
Fourth Quarter	...	401	396	392	383	374

MONTHLY AVERAGES

1956*	429	1953	388	1950	321	1947	304	1944	227
1955	398	1952	381	1949	312	1946	279	1943	225
1954	394	1951	370	1948	321	1945	236	1942	223

Aberthaw Co.

*Estimated.

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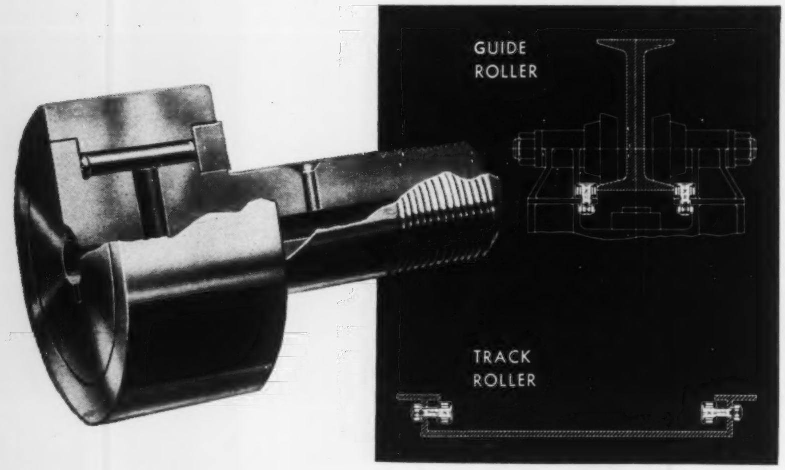

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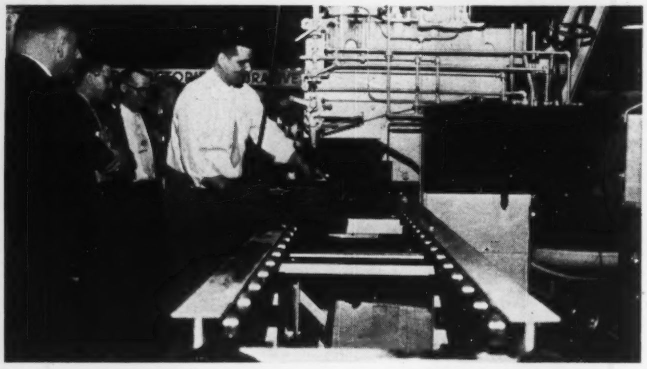
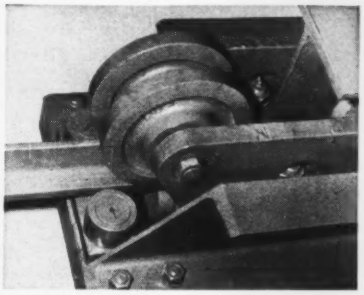
In guide and support roller applications CAMROL Cam Followers insure free rolling action and positive side thrust while eliminating the wear of more costly flanged wheels. Then, too, they provide improved alignment and low starting and running friction with high unit load and shock capacity, especially at low speeds as track rollers. Lubrication is simplified and maintenance can be reduced to a minimum in these applications. Specify the interchangeable sealed SGR series for added protection against contamination.

CAMROL CF bearings provide friction-free track rollers for automatic mold blower

TRADE MARK



McGill CAMROL CF rollers are used as guide rollers to form a mold conveyor in the Beardsley & Piper MBS-20 Mold Blower. The machine blows and squeezes cope or drag in a single automatic operation, handling up to 4 molds per minute. The CAMROL CF bearings replaced less efficient friction rollers in this application. Although, the duty here is rather light and speeds slow, the cam follower bearing provides lesser starting and running friction. This helps speed the flow of work from the machine, which must be fast and automatic. The integral stud feature eases assembly and its standard design simplifies procurement.



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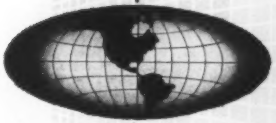

STEEL's FORUM ON

Technical Progress

Prologue to metalworking's fabulous future is the advancing technology of today and developments planned for tomorrow. STEEL has asked 289 authorities to give you an inside look

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Asst. Manager, Freyn Dept.
Engineering & Construction Div.
Koppers Co. Inc., Pittsburgh

NORMAN F. TISDALE
Manager of Sales, Molybdenum Corp.
of America, Pittsburgh

W. H. COLLISON
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R. E. BIRCH
Director of Research, Harbison-
Walker Refractories Co., Pittsburgh

STEELMAKING

FORUM ON TECHNICAL PROGRESS

Continuous casting is ready for carbon steel . . . sintering gets more attention . . . more all-basic open hearths planned . . . world capacity for oxygen converters will reach 7.5 million tons a year by 1958 . . . rare earths solve problems . . .

Mr. Black . . .

In early 1956, rimmed steel slabs were successfully cast at rates up to 2 tons per hour per inch of slab width, and killed steels at rates up to 2½-tons per hour per inch of slab width. This means that the day is not far distant when tonnage steels can be cast in a truly continuous process, with the economies usually associated with conversion of batch to continuous operation.

Particularly significant is the possible combination of a continuous casting machine for slabs 6 or 8 in. x 40 in. (or larger) with a top blown oxygen converter supplying molten metal in heats of about 50 to 60 tons each 40 minutes. Development of equipment for changing ladles and pouring boxes without stopping the casting operation does not appear too difficult. So far as is known, there is nothing in the casting machine or its accessories which would limit the period of a run.

Mr. Tisdale . . .

Rare earths are becoming increasingly important. Their use in steel is getting greatest impetus in the rolling of low carbon grades, either alloy or straight carbon. Savings in surface preparation costs and increased yields have been demonstrated by tonnage runs.

Rare earths are a valuable aid in processing steels whose copper content is abnormal. When difficulty in hot rolling is further accentuated by tin, arsenic, lead and other materials, they have a beneficial effect.

Plate steels, deep drawing sheet steels, silicon and stainless steels are helped by rare earth additions. Rare earths also are going into steel demanding special transverse properties.

It is safe to say that rare earths will be a carefully investigated group of elements in 1957. Many new uses are sure to be developed.

Mr. Collison . . .

The first blast furnace of 30-ft hearth diameter (it's at Great Lakes Steel Corp., Detroit) has been in operation 18 months. Operating data for October, 1956, are:

Total iron production, 1768 tons per day; scrap free iron production, 1764 tons per day; coke rate, 1697 lb per ton; stone rate, 805 lb per ton; dust rate, 152 lb per ton; average wind rate, 116,302 cfm; top pressure, 4.5 psi; average blast temperature, 1023°F; moisture in blast, 6.7 gr per cu ft; sinter in burden, 40 per cent; coarse ore in burden, 20 per cent; iron in burden, 54.7 per cent.

This furnace has operated without serious problems and with increasing production. It is believed that its best performance has not been attained. There is no indication that it is excessively large.

It's possible that iron from direct reduction will assume a worthwhile, although supplemental, role in steelmaking. Three developments have changed this situation: 1. New ores of low gangue content. 2. Continuous operation employing the fluidized solid technique developed in the catalytic cracking of petroleum. 3. Low cost reducing gases produced from almost any hydrocarbon fuel. Advantages expected are flexibility, low cost of installation and possibility of locating plants in areas remote from coking coals. At least three processes and three pilot plants are known.

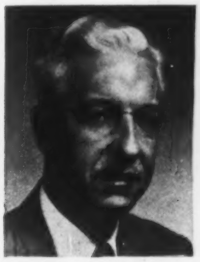
Mr. Birch . . .

New developments in basic refractories, particularly in improved steel casings within the brick and around them, have come just in time for an important role in the accelerated trend to the all basic open hearth.

W. A. STERLING
President
Cleveland-Cliffs Iron Co., Cleveland

D. E. CUMMINGS
Manager, Steel Mill Sales Div.
Air Products Inc., Allentown, Pa.

P. S. SAVAGE
Vice President, Donner-Hanna
Coke Corp., Buffalo



M. W. LIGHTNER
Vice President-Applied Research
U.S. Steel Corp., Pittsburgh

New furnaces which went on the line this year were dependent on these refractory designs for their suspended roofs.

The all basic furnace and the use of the oxygen lance in the open hearth has led to an increase in the use of basic refractories for the top portion of the checker setting. In this application, forsterite type refractories are doing well.

The electric furnace roof is benefiting from a new ringed design of sprung construction, and utilizing special key arches and key wedges in small sizes which lay up to a close fitting roof without laborious cutting. With this construction, the small sizes are firmly keyed into place.

Mr. Sterling . . .

With ample ore available to meet steel requirements in 1957 and the next few years, the main problem of iron ore companies will be the production of ores with sufficiently high iron content to meet the more exacting demands of the expanding steel industry.

This can be accomplished by the production of high grade agglomerates from suitable taconite and jasper ores, and through an extensive improvement program on the standard ores produced from the open pits and underground mines.

There are vast deposits of good iron in the U. S. and Canada from which suitable taconite and jasper ores can be concentrated and agglomerated into a product that has an excellent structure, a natural iron of 60 to 66 per cent and low natural silica. The main problem will be the speed with which these mines can be brought into production. This will take time and large capital expenditures. It will probably be at least ten years before sufficient volume from this source is secured. Meanwhile, domestic ores will have to face the stiff competition of high grade foreign imports.

Mr. Cummings

Oxygen required per ton of steel produced was reported as 30 cu ft in 1930, 50 in 1940, and 250 in 1956. Compare this with new uses of oxygen in the steel industry which have been proved and are likely to be adopted widely: 1. Open hearth roof lance, about 500 cu ft per ton. 2. Open hearth combustion, between 500 and 1000 cu ft per ton. 3. Top blown converter, about 2000 cu ft per ton. 4. Blast furnace enrichment, about 2200 cu ft per ton for 10 per cent increased tonnage. 5. Manufacture of hydrogen for direct reduction of iron ore, about 8000 cu ft per ton of ore.

These new uses have ruled out the delivery of oxygen in containers—as a gas or liquid. The manufacturers of oxygen generating equipment realize that tonnage uses of oxygen differ considerably, and there is no one type of system that is always the best answer for each use. We have divided generating systems into four classifications to give lowest cost oxygen for flow requirements.

Mr. Savage . . .

During 1956, chemical type coke ovens operated at maximum practical capacity, and the production of beehive coke expanded close to its practical capacity. A total of 565 chemical type coke ovens were built or rebuilt and put into operation by the end of 1955, and 614 more were built or rebuilt during 1956. At the end of 1955, the number of chemical type ovens over 30 years old had dropped to 23.8 per cent of ovens operating. They accounted for about 15 per cent of the coke produced.

Coke capacity in 1957 should be close to the needs of the country if beehive ovens are used to their practical capacity (5 million tons per year).

Low prices of coal chemical products will continue to keep the emphasis on quality coke production rather than on gas and coal chemicals. Catalytic refining of coke oven light oil will grow because of competition within the coke oven industry for the nearby chemical markets for benzol, toluol and xylol.

Mr. Lightner . . .

The opinion has prevailed in many quarters that the reducibility of the ore agglomerate is secondary as far as performance in the blast furnace is concerned. This perhaps is true with partially beneficiated burdens, but may not hold for fully beneficiated ones. If that is the case, attention will be directed toward the factors affecting reducibility—such as the porosity and petrographic structure of the agglomerate.

Present furnaces have been developed for run-of-mine Mesabi ores. It would not be too surprising to find that with improved burdens some revision of blast furnace lines will be necessary. Also, the quality of coke produced for best practice with partially beneficiated burdens may not

H. M. RICH
Vice President, Electro Metallurgical Co., Div. of Union Carbide & Carbon Corp., New York

C. R. AUSTIN
Manager, Oxygen Steel Div. Kaiser Engineers, Oakland, Calif.

H. R. LOXTERMAN
General Sales Manager Blaw-Knox Equipment Div. Blaw-Knox Co., Pittsburgh

H. R. BOATMAN
Asst. Supt., Quality Control Inland Steel Co., Chicago

be the most desirable for fully beneficiated ores.

In the next few years we are almost certain to see many changes in sintering machines, blast furnaces and coke oven practices to obtain maximum benefits from fully beneficiated ore burdens. It will be of interest to see to what extent increased blowing rates and higher blast temperatures can be used to increase blast furnace production with improved burdens.

Mr. Rich . . .

This year should be one of continued growth for ferroalloys. With steel production expected to reach 125 million ingot tons and output of stainless estimated at 1.2 to 1.3 million, the demand for alloys is bound to mount.

The chrome-nickel-manganese (200 series) stainless steels will develop rapidly. What has already happened makes the goal of 150,000 ingot tons by 1960 seem conservative. In 1955, production of the 200 series was a little under 2000 ingot tons. In 1956, it approached an estimated 20,000 tons. Output will undoubtedly rise steeply this year. This means increased demand for the nitrogen bearing grades of chromium and manganese alloys.

Look for the use of high temperature alloys (for such applications as gas turbines and jet engines) and special alloys (for atomic energy needs) to grow rapidly this year. These developments will produce higher demands for chromium, nickel, cobalt, molybdenum, tungsten, columbium, titanium and other alloying materials.

The use of low carbon stainless steels should show more than ordinary growth this year. They are used particularly in the processing industries for corrosive applications. Stepped up demand will mean greater need for the extra low carbon grades of ferrochrome.

Mr. Austin . . .

Within the last four years, steel tonnage from the oxygen converter has increased rapidly to a current figure which is in excess of 2 million tons. New plants being built in Germany, the Netherlands, India, Japan and the U.S. will boost this tonnage to an estimated 7.5 million tons by the end of 1958.

Steel with a carbon content of less than 0.35 per cent has been the principal product. In Austria, steel is produced containing up to 0.70 per cent carbon. It can be anticipated that in the next several years high-carbon and low-carbon steels can be produced by the oxygen converter with equal facility.

The production of low alloy steels is another area under investigation in this new process. Recent experiments in Austria indicate that the oxygen converter process can use pig iron of high phosphorus content, which up to now has been considered unsuitable. This would give a great impetus to the growth of steelmaking in the Birmingham district.

Mr. Loxterman . . .

Increased labor costs and a nonequivalent increase in prices, along with continuing demand, will cause the steel industry to strive for increased production with a sharper eye on costs. More efficient material handling and more mechanization will come into the picture. A new method of pouring ingots automatically to accurate weight will be introduced.

Special attention will be paid to more efficient use of materials and recovery of waste. There will be an increase in the practice of making additions direct to the ladle to save scarce materials and reduce costs. More sintering plants will be built. The new pickle liquor recovery process will be watched with interest.

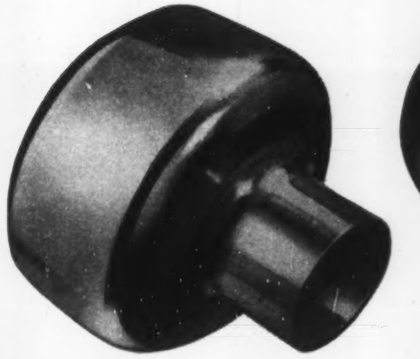
With about 7 million tons of new capacity planned for 1957, and a probable catching up with demand late in the year, decisions will have to be made about many old, marginal steel producing units. We look for an extensive modernization program to put them on a competitive basis. The high capital cost of new plants makes this attractive.

Mr. Boatman . . .

The trend toward increasing consumption of leaded steels is evidenced by production figures. Using 1952 as the base year, domestic production increased 125 per cent in the 1952-1954 period. In the 1952-1956 period, the increase comes to 550 per cent when you use a six-month average for 1956. Applications are being restricted by limited production facilities.

Increased use of leaded plate steels is also being hampered by limited production facilities. They have won wide acceptance in the mechanical rubber mold field and in the production of plates for condensers and evaporator heads.

Recognition of commonly produced standard analyses of leaded steels is under consideration by the



4 OF THE MANY STYLES OF THE ONE-PIECE SEAMLESS DOOR KNOBS FABRICATED FROM RUGGED REVERE BRASS STRIP.

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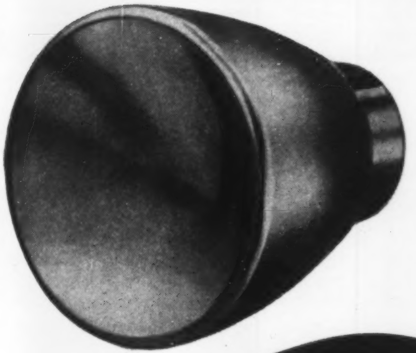

The one-piece door knobs shown are drawn from a single blank of Revere Brass Strip, presenting an attractively smooth, unbroken surface without the need for seams or welds.

Because they are made by a unique procedure the manufacturer tells us that the brass must stand up under mighty rugged going, and that to produce the quality knobs they do, at an economical production level, the brass they use must have:

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2. *Absence of any sign of fracture or crimping when drawn.*
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Revere Brass Strip may be able to help *you* make a better product at less cost. You'll never know until you talk it over with one of our TA's (Technical Advisor). There's no obligation, of course. And such a discussion could save you a substantial sum of money. Such has been the case many, many times.

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H. S. SCHAUFUS
Chief Metallurgical Engineer
Vanadium Corp. of America
Cambridge, O.

HJALMAR W. JOHNSON
Vice President, Charge of Steel Mfg.
Inland Steel Co., Chicago

AISI and the SAE. Investigations covering comparative properties of leaded and nonleaded steels are under way (or have been made). Previously published data are being carefully rechecked. At this point, investigations support the accuracy of available data.

Mr. Patterson . . .

Vacuum pouring is being tested, and those plagued with gas problems hope the practice can be adapted to the quantity production of ingots, rather than large single ingots.

Much progress is being made with consumable electrode melting of high temperature alloys under vacuum. At Allegheny Ludlum, we have been producing ingots 20 in. in diameter, which weigh 5000 lb. We expect to be producing 10,000 to 12,000-lb ingots at the rate of 1½-million ingot pounds per month.

Mr. Cashin . . .

With two new oxygen converter plants coming on the line in 1957, there is a growing interest in suitable refractories. The question of which type is best is being debated. This reflects variations in practice.

In one of the two Austrian oxygen steelmaking plants, the working lining of the vessels consists of a brick manufactured from a dolomitic (high lime) magnesite grain, bonded with low naphthalene water free tar. The other, after initial experience with tar bonded magnesite linings, has standard commercial burned magnesite brick.

A Canadian plant chose still a third composition—brick composed of standard steelmaking grade deadburned dolomite, tar burned. The only U.S. plant with the oxygen converter process experimented with deadburned magnesite and periclase brick and magnesite brick made of Austrian grain. More recently, it has used brick linings composed of a blend of magnesite and deadburned dolomite grains, bonded with tar.

With all the major refractory companies working on this problem, we should see a solution this year.

Mr. Schaufus . . .

Co-operative studies are being undertaken by makers of ferroalloys and steel producers to improve soundness and homogeneity by modifications of deoxidizing and desulphurizing additions and practices. One outcome of these efforts last year was a calcium-silicon-aluminum ferroalloy that has done much to alleviate trouble and improve yields of several steel products.

Another problem receiving attention by the ferroalloy industry: The increase in the amount of scrap contaminated with elements such as tin, lead and zinc, which derive from leaded, tinned and galvanized steels. Every effort is being made to assist steelmakers in dealing with this problem, especially in the production of highly alloyed products. Addition agents containing boron, rare earth elements and others already have found a place in avoiding troubles in hot working.

The outstanding phase of ferroalloy development continues to be the production of standard alloys which are superior to existing ones. Of particular significance are the chromium types. In the future, they will have to meet an imposing list of special demands.

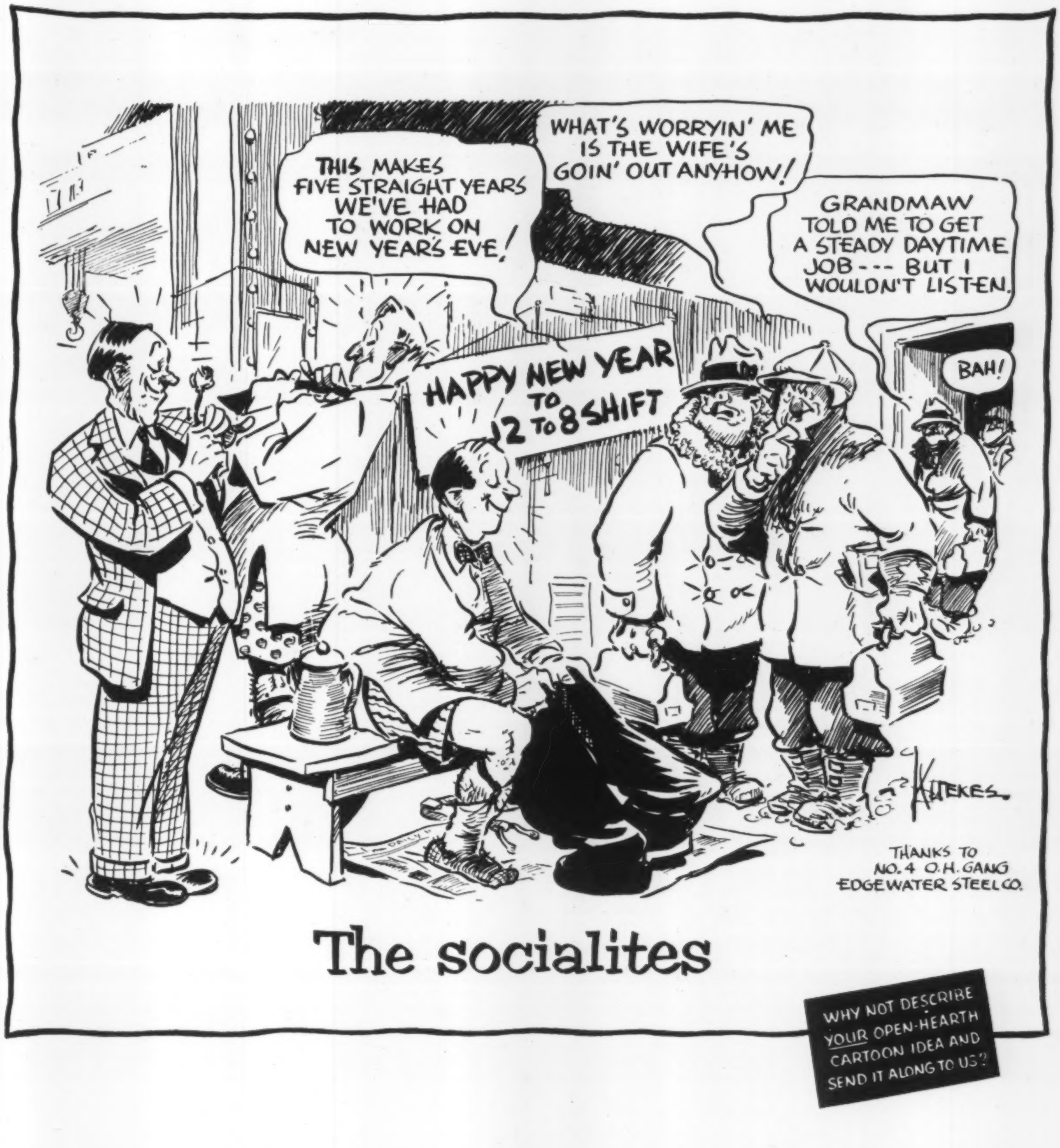
Mr. Johnson . . .

This picture of the steel industry is obsolete: Furnaces belching smoke . . . cranes and confusion . . . brawny men stripped to the waist, swinging massive sledge hammers to shape a finished product. Such operations—picturesque as they are—are luxuries that the industry can no longer afford.

Today, skip loads of materials are hoisted and dumped into a perfectly sealed blast furnace top where no valuable gas is allowed to escape. No longer do the open hearth crews with their shovels rhythmically move in a circle from dolomite pile to furnace door, making up the bottom and back wall. Instead, the dolomite machine moves quickly into place and does the job. We have the continuous hot strip mill, the continuous galvanizing line and the continuous electrolytic tin line.

Arduous labor has been eliminated, but the technical problems are not solved. Even the blast furnace, time honored for its efficiency, is being subjected to a most severe scrutiny, which may lead to its improvement or supplementation with "gaseous reduction in a fluidized state." The availability of cheap hydrogen, oxygen and nitrogen and the development of continuous casting, coupled

THE OTHER TURN


THIS MAKES FIVE STRAIGHT YEARS WE'VE HAD TO WORK ON NEW YEAR'S EVE!
WHAT'S WORRYIN' ME IS THE WIFE'S GOIN' OUT ANYHOW!
GRANDMAW TOLD ME TO GET A STEADY DAYTIME JOB --- BUT I WOULDN'T LIST-EN.
BAH!
HAPPY NEW YEAR TO 12 TO 8 SHIFT
KUEKES

THANKS TO
NO. 4 O.H. GANG
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AMASTEEL Shot is available in ALL S.A.E. Shot Sizes 780, 660, 550, 460, 390, 330, 280, 230, 170, 110, 70

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E. W. Davis Works, Reserve
Mining Co., Silver Bay, Minn.

H. E. ROWEN
General Manager, Dwight-Lloyd Div.
McDowell Co. Inc., Cleveland

with new steelmaking processes, will spur many important changes.

There are problems to be solved. Competent imaginative people are needed.

Mr. Lysobey . . .

The carbide injection process for desulphurizing blast furnace iron continues to receive widespread attention. It's undergoing extensive evaluation in plant-scale tests. Results have demonstrated its practicability.

External desulphurization gives hot metal producers a tool to cope with high sulphur casts. It lets them deliver extremely low sulphur analyses for special purpose steels. It also gives greater flexibility in the operation of the blast furnace.

Production size carbide treating stations are in operation at a number of blast furnace plants. Additional installations will be put into operation at integrated steel mills this year.

Mr. Kopetz . . .

We expect increased application of chemical processes in the steel industry. Direct reduction of iron ore, desulphurization of BTX (light oils), use of oxygen and other gases, utilization of heat from nuclear fission, treatment of wastes and the upgrading of coke oven gas and other byproducts into more valuable materials are process developments helping to mold the future of steel.

This year will see the initial performance of many of these important steps leading to more efficient and profitable operations. The first U.S. installation in a major steel mill which uses raw coke oven gas as the source of hydrogen for the synthesis of ammonia will be on stream. Several BTX processing units will be completed. Pilot plant results will be available on an installation which regenerates waste pickle liquors. Work should be under way on commercial plants for direct ore reduction.

Mr. Davis . . .

Last year, Cleveland-Cliffs joined Reserve, Erie and Oliver in the processing of taconite (jasper in Michigan). Total shipments from the five plants in production was about 4 million tons last year. Production in 1957 should reach nearly 6 million tons.

The future of the Lake Superior district is becoming quite clear. Production of direct shipping and concentrating ores will continue for many years but at a slowly declining rate. Production of taconite agglomerates from the magnetic and nonmagnetic iron formations will increase rapidly to maintain total shipments at or in excess of past records.

Much attention is being directed toward the magnetic roasting of the nonmagnetic taconites, and important developments in this field can be expected. Commercially successful magnetic roasting will make available immense tonnages of lean ore and taconite on the central and west Mesabi, the Cuyuna and westward extensions of both ranges.

Mr. Rowen . . .

Since 1907, an important iron producer has provided his plants with about 6 or 7 million tons of sintering capacity per year. In 1956-57, he is bringing this total up to nearly 20 million tons. And an addition which will equal his first 50 years of production is contemplated. Another producer reaching for perhaps 5 million tons of capacity per year is expanding.

We see the rotating disc or saucer taking over to give maximum mixing and permeability to charges which will not pelletize, while producing pellets of the fractions which will. Studies with the McDowell Wellman Flying Saucer show that the sintering plant no longer will be figured for up to 2 tons per square foot per day. We see Dwight-Lloyd sintering going up to 60 to 65 million tons per year of capacity.

Mr. Cline . . .

Mechanical blast descaling of hot-rolled wire rod ahead of cold drawing and cold heading operations has proved satisfactory. It is expected to rapidly replace acid pickling.

The method is already established for the processing of hot-rolled strip and sheets, slabs and billets, structural members and bar stock. It's also used to etch steel mill rolls. But changes in equipment design have been made to make further savings in cleaning costs possible. Special alloy steel blast cabinet liners and abrasive-throwing blades have been

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MESTA 42" FOUR-HIGH TWIN-STAND
HIGH-SPEED SKIN PASS MILL

MESTA 60" CONTINUOUS PICKLING LINE WITH FLASH WELDER,
TRIMMER AND UP-COILER OPERATING AT INLAND STEEL COMPAN

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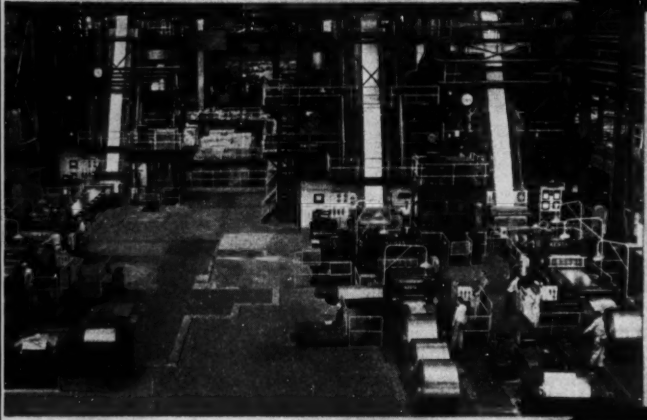
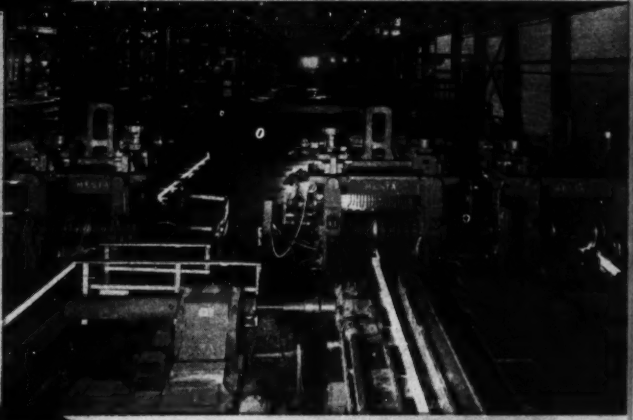
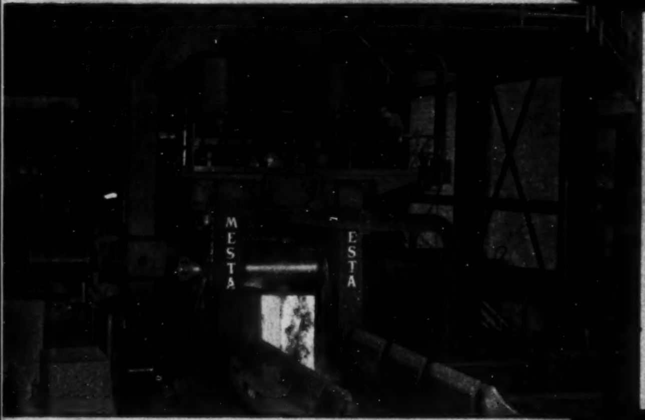


THREE MESTA 48" CONTINUOUS GALVANIZING
LINES WITH AUXILIARY EQUIPMENT



MESTA 32" BAR MILL SHOWING INTERMEDIATE
LEADER AND FINISHING STANDS

MESTA



MESTA 45" x 90" UNIVERSAL REVERSING SLABBING MILL ROLLING
20-TON INGOTS INTO SLABS AT GREAT LAKES STEEL CORPORATION

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MESTA 56" FOUR-HIGH HOT STRIP MILL FINISHING STANDS
ROLLING STAINLESS AND SILICON STEELS

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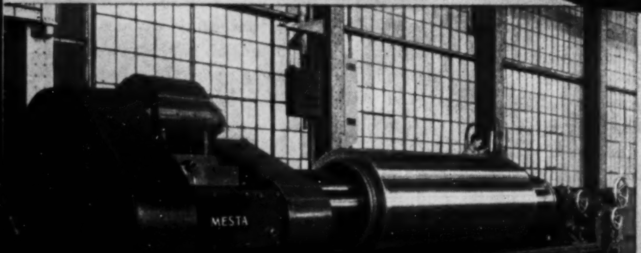

MESTA HEAVY DUTY TRAVELING WHEEL-TYPE
ROLL GRINDER FINISHING A 59" x 154" MESTA BACKING-UP ROLL

MESTA CONTINUOUS CLEANING AND ANNEALING LINE FOR TIN PLATE
WITH PAY-OFF REEL, DOUBLE SEAM WELDER, SHEAR, AND TENSION REEL

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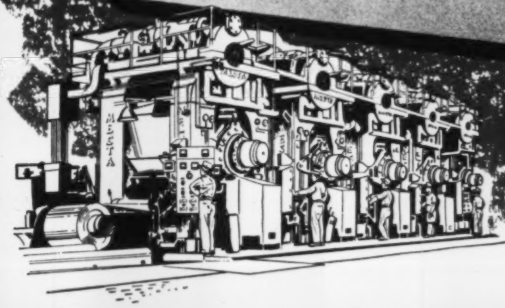

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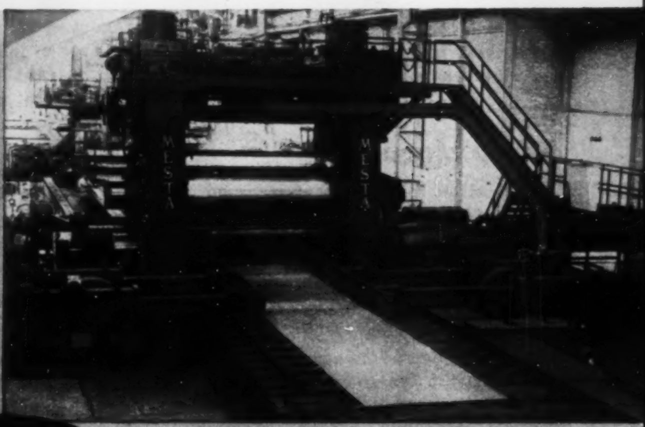
MESTA 42" HIGH-SPEED COMBINATION ROTARY FLYING SHEAR AND LEVELLER WITH ROTARY SIDE TRIMMER



MESTA 132" FOUR-HIGH REVERSING PLATE MILL INSTALLED AT SOCIETE ANONYME COCKERILL-OUGREE, BELGIUM

MESTA

TWO STANDS OF A MESTA 30" TWO-HIGH HORIZONTAL CONTINUOUS BILLET MILL WITH VERTICAL EDGER

MESTA 66" FOUR-HIGH FOUR-STAND TANDEM COLD MILL

C. R. CLINE
Engineering Asst. to President
Wheelabrator Corp.
Mishawaka, Ind.

F. B. O'MARA
Manager, Electrode Products Sales,
National Carbon Co., Div. of
Union Carbide & Carbon Corp.,
New York

W. K. LOMBARD
Vice President & Sales Manager
Thermal Research & Engineering Corp.
Conshohocken, Pa.

R. P. HEUER
Vice President, General Refractories
Co., Philadelphia

developed to reduce maintenance due to wear. The new liners last some 50 times as long as the mild steel ones formerly used. A new abrasive-hurling wheel also provides faster cleaning speeds.

Cast steel shot continues in use as the abrasive for general cleaning of hot-rolled sheets and strip. But cast steel grit has been found beneficial for etching hot-rolled fabrications for porcelain enamel coating.

Mr. O'Mara . . .

Authorities predict that by 1970 electric furnaces will represent more than 14 per cent of the nation's steel capacity, producing from 25 million to 35 million tons a year. This means furnaces will get a lot bigger, and there will be many more. The largest in operation are rated at about 200 tons per heat, but 250-ton units may soon be installed. It's possible that they will be the six-electrode type.

Bigger, higher-powered furnaces will call for larger electrodes. Graphite electrodes as large as 45 in. in diameter are being produced. But it is felt that 24-in. graphite electrodes are best suited for high powered furnaces of the 250-ton, six-electrode type.

Regardless of future demands for electrodes of larger size and of different shape, improvements in their quality will make it possible for them to handle increased power with probably no increase—possibly a decrease—in electrode consumption per ton of steel.

Mr. Lombard . . .

An important change in blast furnace air heating will become a reality in 1957. To supplement (or even replace) the stove, fired heat exchangers are being designed. They will do the air heating job on a continuous basis, which the stove now does on a cyclic basis.

This type of indirect fired air heater can be used in two ways: In series with the stove, or in parallel. The series arrangement boosts the air inlet temperature to the stove and will either boost the outlet blast air temperature or prolong the cycle. The parallel arrangement gives less of a pressure drop problem, but is more limited in reaching high blast air temperatures (above 1400°F) because the heater is built with metal tubes.

For a straightforward increase in time at top temperature, a fired heat exchanger can have the same effect as adding another stove, and at considerably lower cost.

Mr. Heuer . . .

Last year marked the evolution of the all-basic open hearth from an experimental curiosity to a proved actuality.

Design thinking in 1957 will be on the attributes of suspended basic refractories, not the limitations of silica. Radical changes in furnace design and contours are possible. The trend toward smaller uptakes and furnace ends continues. Last year saw the installation and successful operation of the first Maerz port design in America. In all probability, 1957 will see increased interest in this design. More drastic changes in open hearth profile will be considered. This may include the convergent wall furnace (Maerz-Boelens), recently developed in Europe and presently operating successfully on six furnaces, including a 150-ton furnace in Germany.

The economic picture of the all-basic open hearth is attractive. It offers a means of getting additional product through greater unit productivity and decreased capital investment.

Mr. McQuaid . . .

Last year proved conclusively that the steel melting operators are in an uncertain position when they try to base estimated delivery costs on the price of scrap. It has been demonstrated many times that the price of scrap is always all that the market will bear and is directly affected by the supply available. If the price of steel, especially electric furnace steel, is to be at all stabilized, it will be necessary to find a competitive charge material which can act as a control medium.

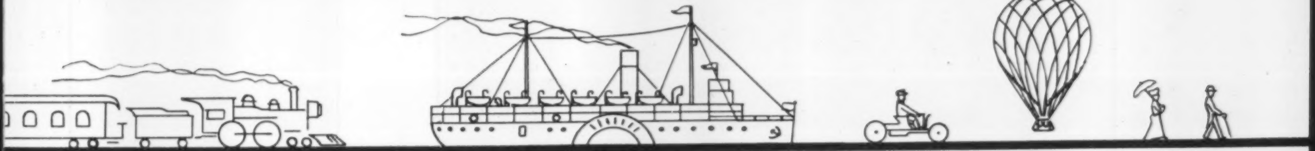
If blast furnace capacity were available for electric furnace tonnage, it would pay (at present scrap prices) to consider some means of desiliconizing hot metal at the furnace and putting it through the pig casting machine.

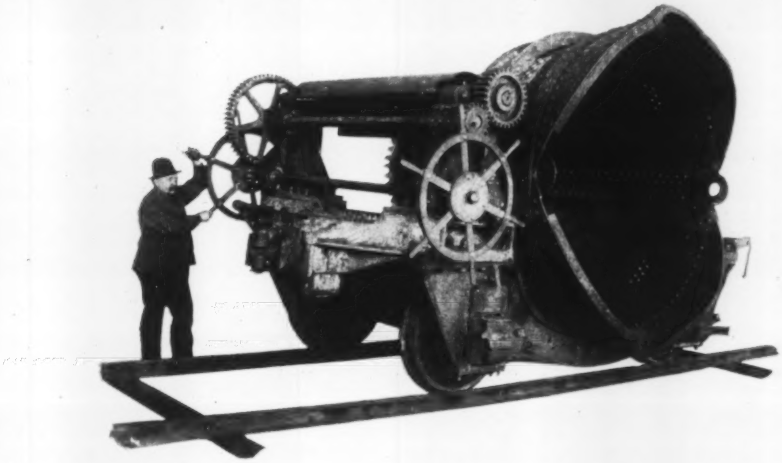
Hydrogen reduced concentrated ore, while simple to produce and economically feasible at current scrap prices, apparently ceases to be in-

1902 – 25 tons per open hearth heat

1957 – 550 tons per open hearth heat

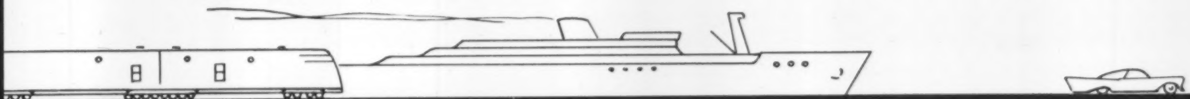
POLLOCK FEEDS HUNGRY OPEN HEARTHS



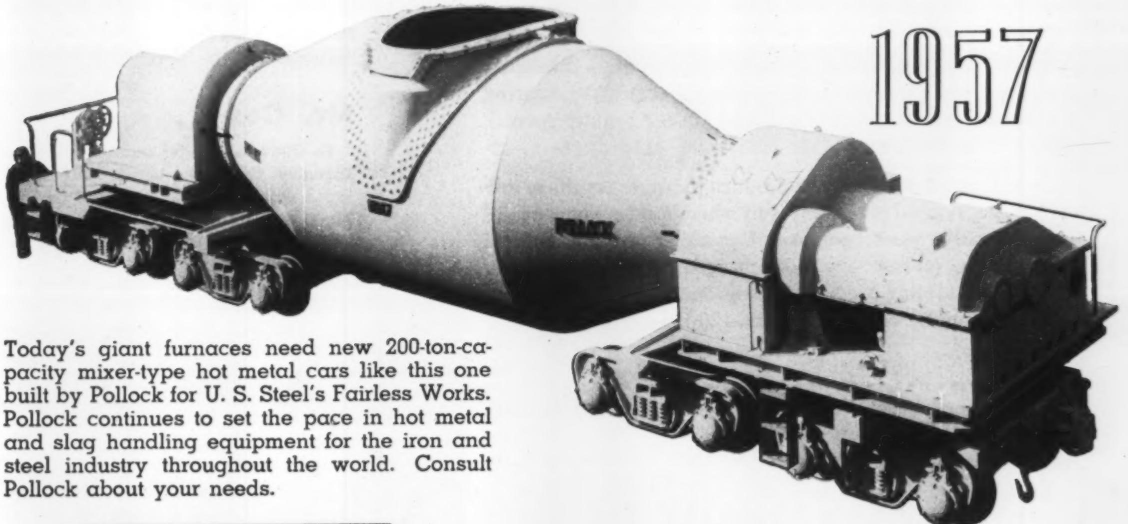


1902

Pigs went to market faster after Pollock designed and built this first 20-ton hot metal car. It was the first of thousands of hot metal cars built by Pollock.



1957



Today's giant furnaces need new 200-ton-capacity mixer-type hot metal cars like this one built by Pollock for U. S. Steel's Fairless Works. Pollock continues to set the pace in hot metal and slag handling equipment for the iron and steel industry throughout the world. Consult Pollock about your needs.

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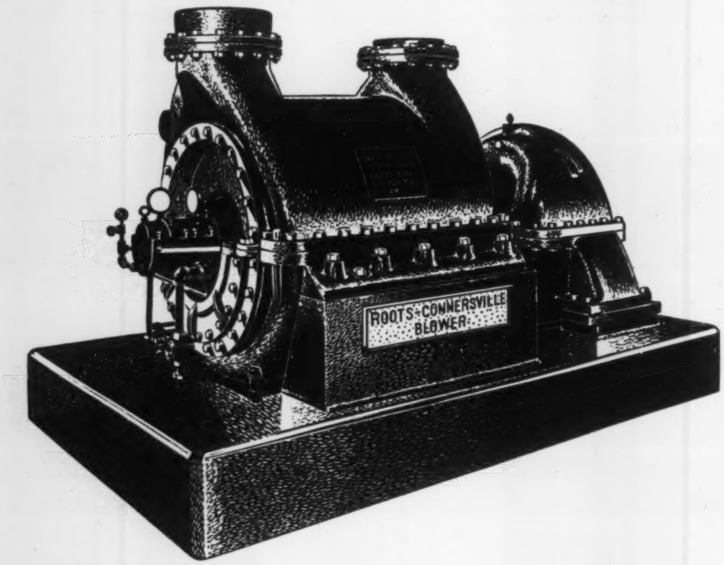

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H. W. McQUAID
Consultant
Cleveland

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Vice President, Metals Div.
Arthur G. McKee & Co., Cleveland

teresting at the first reduction in scrap prices. With a reliable source of hydrogen and magnetite or taconite concentrate, "sponge iron" should be competitive with #1 scrap even after a decided cut in price.

If the steel industry operates at its predicted rate in 1957, it is quite certain that the pressure for scrap will certainly increase and the need for a competitive stabilizing charge material will be strong.

Mr. Cox . . .

In 1957, a larger number of blast furnaces than ever before will be using a completely beneficiated burden. Much new information on added plant capacities and lower fuel utilization will be available.

The availability of low silica Venezuelan ores and some low silica concentrates has revived interest in the gaseous reduction of iron ore. This should become more apparent this year. If the developments are successful, we can expect the electric furnace to come into greater use.

More attention will be given to the better time utilization of open hearths by increased use of oxygen in an effort to achieve lower end costs. In this connection, a number of steelmaking processes are being developed, including the Linz process,

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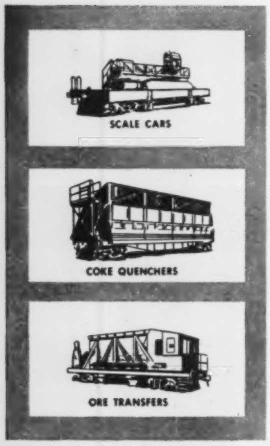

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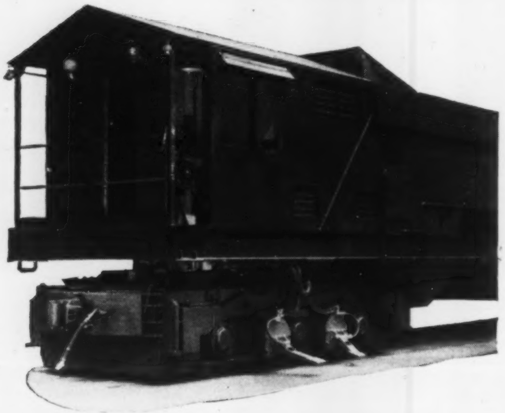

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JOHN P. HOLT
Executive Asst. to Sales Vice President, Basic Inc., Cleveland

CLARENCE E. SIMS
Battelle Memorial Institute
Columbus, O.

the Kal-Do process of Sweden, and the Rotor method of Oberhausen Huettenwerke, Germany. They are likely to attract greater attention of steelmen this year.

Mr. Holt . . .

Until recently, it has been impossible to make hot repairs on open hearth furnace linings at a rate that equaled or exceeded the rate of erosion. With our new BRI Gun, Model A-20, it is possible to keep a furnace maintained so that backwalls no longer have to be replaced at rebuild time. The gun can be used to emplace extensive, thick patches on the inside of an open hearth furnace at any time during the heat cycle. It is not necessary to shut the fuel off or cut it back. No productive time is lost.

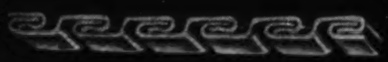
If an open hearth furnace lining is maintained in such a way that neither the front wall nor the backwall needs repairing during rebuild, the determining factor in a rebuild is generally the roof. But roof life is appreciably lengthened when the skewbacks which support it are kept in good condition by gunning.

Mr. Sims . . .

Because of high capital costs and the difficulty of raising capital, the steel industry cannot get its increased

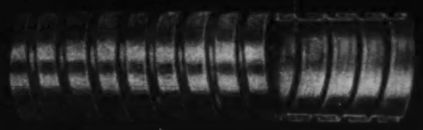
EXTRA HEAVY DUTY

HEAVY DUTY

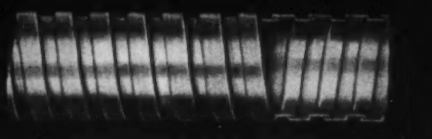


LIGHT DUTY

MEDIUM DUTY



LIGHTWEIGHT EXHAUST



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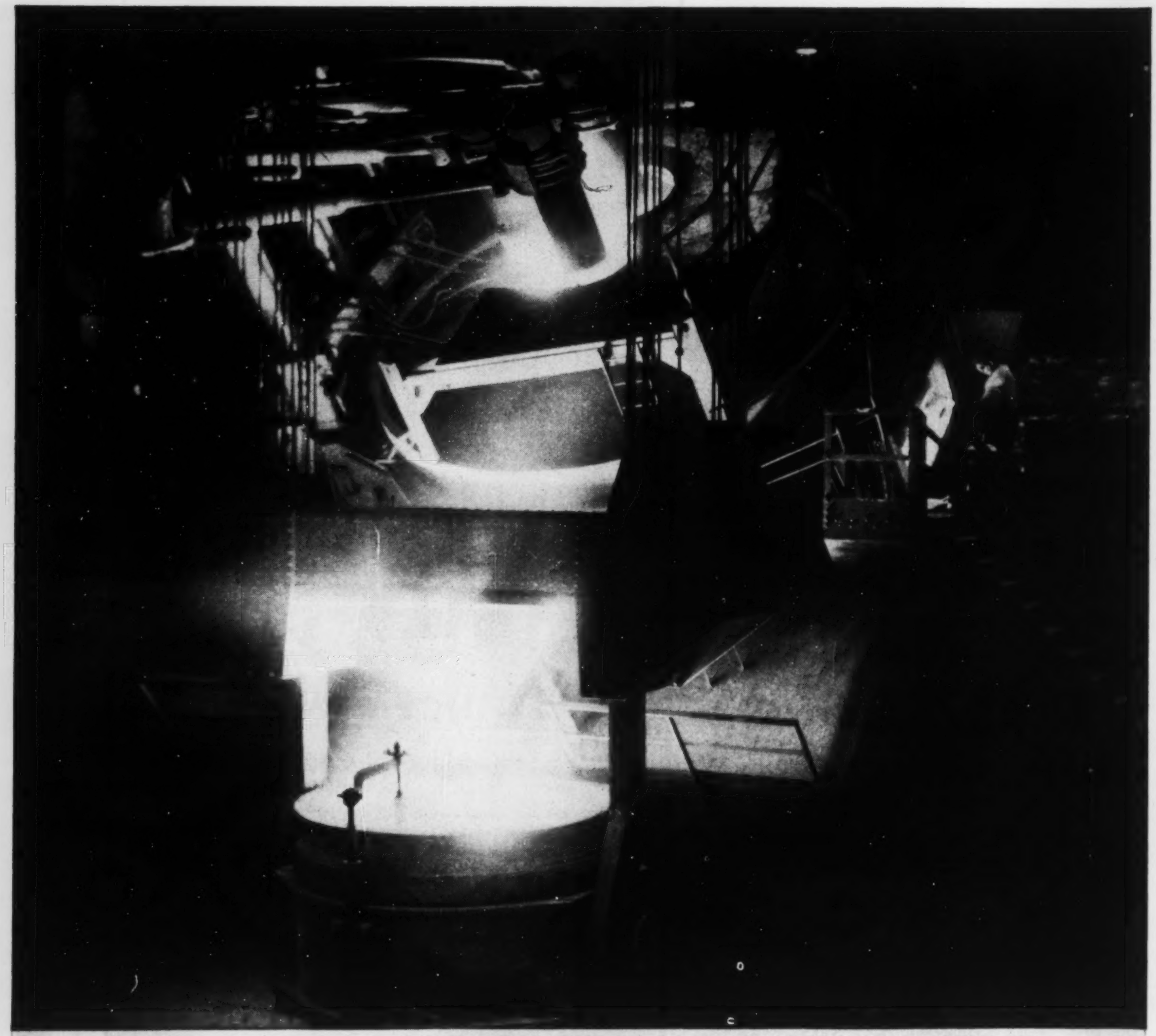

Photo courtesy of American Bridge Division of the United States Steel Corporation

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D. T. ROGERS
Manager, Cold Finished Bar Products
Jones & Laughlin Steel Corp.
Pittsburgh

capacity merely by building new equipment. Much of it must come through increased productivity. This is causing a revolution in steelmaking.

The principal factor in increased productivity has been the availability of low-cost, tonnage, oxygen. An outstanding example is the oxygen converter.

Probably the most versatile use of oxygen is in the open hearth. It can be used to enrich the combustion air or direct, as a pure jet, for decarburization and superheating. Any desired proportion of hot metal and scrap may be used to make any composition of steel in the open hearth range.

The use of the oxygen jet and improvements in scrap preparation, charging practice and furnace design promise that the ideal in production will be reached: 50 tons per hour from the larger open hearth furnaces.

Mr. Rogers . . .

The demand for hot extruded and cold drawn special shapes in carbon and standard alloy steel grades continues to increase. The techniques of extrusion-cold drawing have been rapidly advanced. The result is that applications that were considered doubtful only a few months ago have become production realities. In some cases, cost savings approaching 50 per cent have been realized by the consumer.

One of the most interesting new fields for this technique is in high temperature alloys for supersonic aircraft, rockets and guided missiles. In many instances, these special al-

This is an actual photo of a surface prepared by polishing and etching a cross-section of a forging, to reveal the "grain flow." (x2)

A PICTURE OF ADVANTAGES YOU CAN GET ONLY FROM FORGINGS

In the picture above you see the grain flow in a forging.

This picture demonstrates two things. First, the metal is dense and free from porosity. The impact or pressure of forging helps make it so. Such density is important when parts must have machined surfaces, when they must provide reliable strength and safety, and when they must be tight against leakage of liquids or gases. This quality reduces rejects and saves money. It contributes to safety and saves lives.

Second, notice how grain flow lines follow the shape of the part. This improves impact resistance and fatigue strength of the part. In closed-die forging, these flow lines can be positioned, to give maximum properties where they are needed. As a result, forged parts can be lighter, safer, stronger, and frequently less costly.

Thus this picture shows you why forged metal is *metal you can trust*. You can trust forgings for performance, and to save money. Find out how forgings can improve your products, your costs. Consult a *Forging Engineer*, and send for the booklets offered below.

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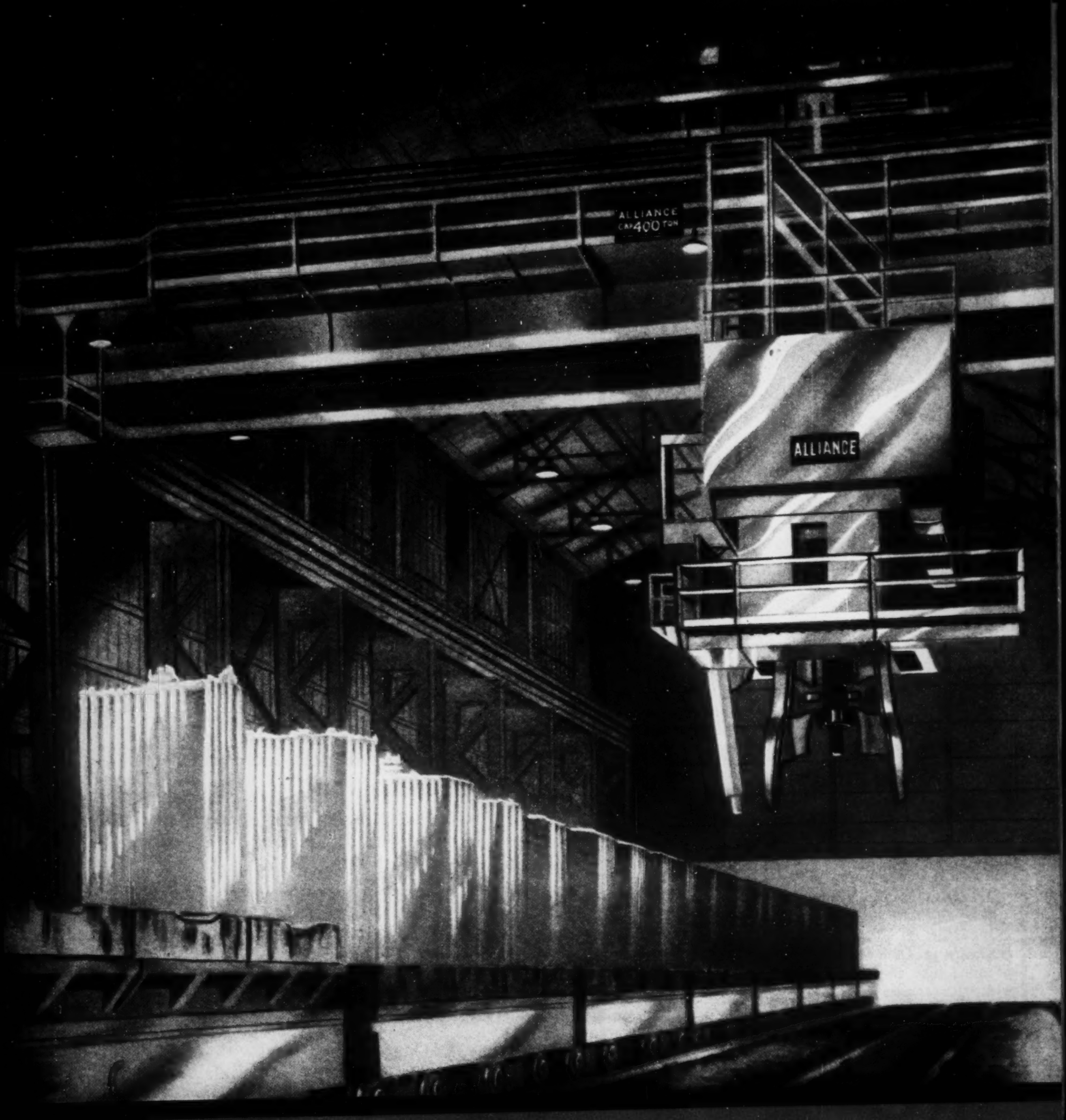
Attach this advertisement signature to your letterhead and mail to Drop Forging Association to receive booklet "What is a Forging?" ☐ *or "Management Guide to Use of Forgings".* ☐ *Check title or titles desired.*



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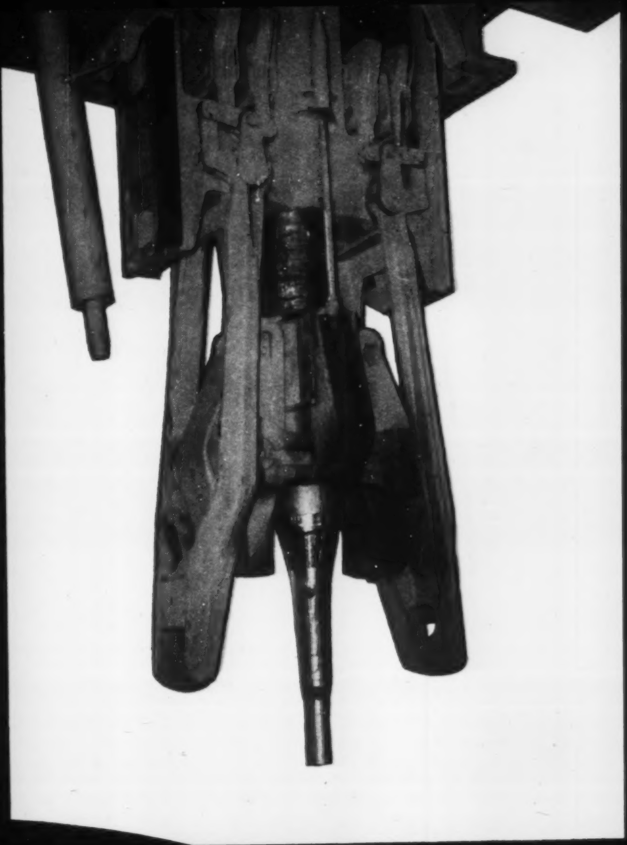

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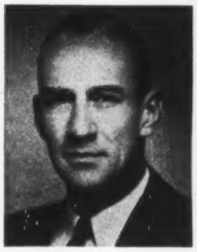

EDWIN N. HOWER
Manager, Construction & Engineering Sales, Machinery Div., Dravo Corp.
Pittsburgh

loys can best be produced in shaped form by hot extrusion. The refinement in section accuracy and surface finish by subsequent cold drawing eliminates much difficult machining of finished parts which the aircraft industry, primarily tooled for aluminum, is not too well equipped to perform. This development is in its early stages, but will bear watching this year.

Mr. Hower . . .

Use of iron ore sinter to increase blast furnace production is receiving more attention from steelmakers and mining companies in this country and abroad. There is every reason to believe that sintering will continue to grow in the years ahead because: 1. The efficiency of sintering machines and equipment is improving. 2. Pig iron production frequently can be boosted by constructing a sinter plant at an investment which is lower than that required for the enlargement of blast furnace capacity.

Sintering plants under construction in the U.S. will nearly double production. Yet a relatively few steel companies are involved. As more companies finalize their plans, construction activity undoubtedly will continue at a relatively high rate for some time.

Mr. King . . .

The past year has seen significant advances in the productivity of ingot facilities. A great number of plants have modernized their shops for larger heat sizes with adequate auxiliary facilities. New furnaces have

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ye dinna want to
turn yer bock on this . . .

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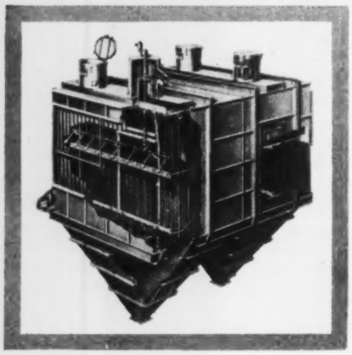

Proper proportioning, side entry of dust-laden gases, add even more extra efficiency and long, maintenance-free life to Buell Cyclones. Large diameter design eliminates bridging and clogging, keeps efficiency high under varying loads.

Buell SF Electric Precipitator also delivers extra dust collection efficiency, due to unique Spiralectrodes and Continuous Cycle Rapping.

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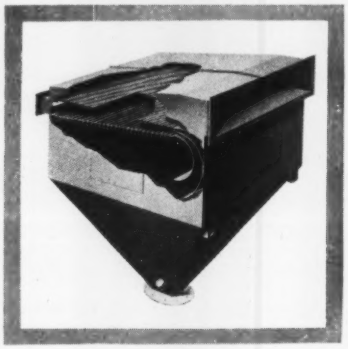

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MECHANICAL ELECTRICAL *Experts at delivering Extra Efficiency in* **DUST COLLECTION SYSTEMS**

C. D. KING
Asst. Vice President, Operations
U.S. Steel Corp., Pittsburgh

A. L. HODGE
Linde Air Products Co., Div. of Union
Carbide & Carbon Corp., New York

been installed in a number of shops. And in a limited number of cases, new plants with heat sizes of at least 300 net tons are being built or proposed for the near future.

Increased hot metal, resulting from blast furnace beneficiated burdens, has provided plants with an improved open hearth charge. This practice is expected to reach new heights in 1957.

A number of large, high powered, top charged electric furnaces for carbon and alloy ingots were installed in the past year, and 1957 will witness an even greater number of such installations. Electric furnace capacity appears to be gaining at a much faster ratio than that of the open hearth.

Mr. Hodge . . .

Advances in economical production, distribution and storage of commercial oxygen have unlocked a host of important innovations, such as oxygen for open hearth combustion, roof lances, decarbonization and the scarfing of hot and cold plain carbon and stainless steels. Recent basic pneumatic processes for high quality, deep drawing steels from

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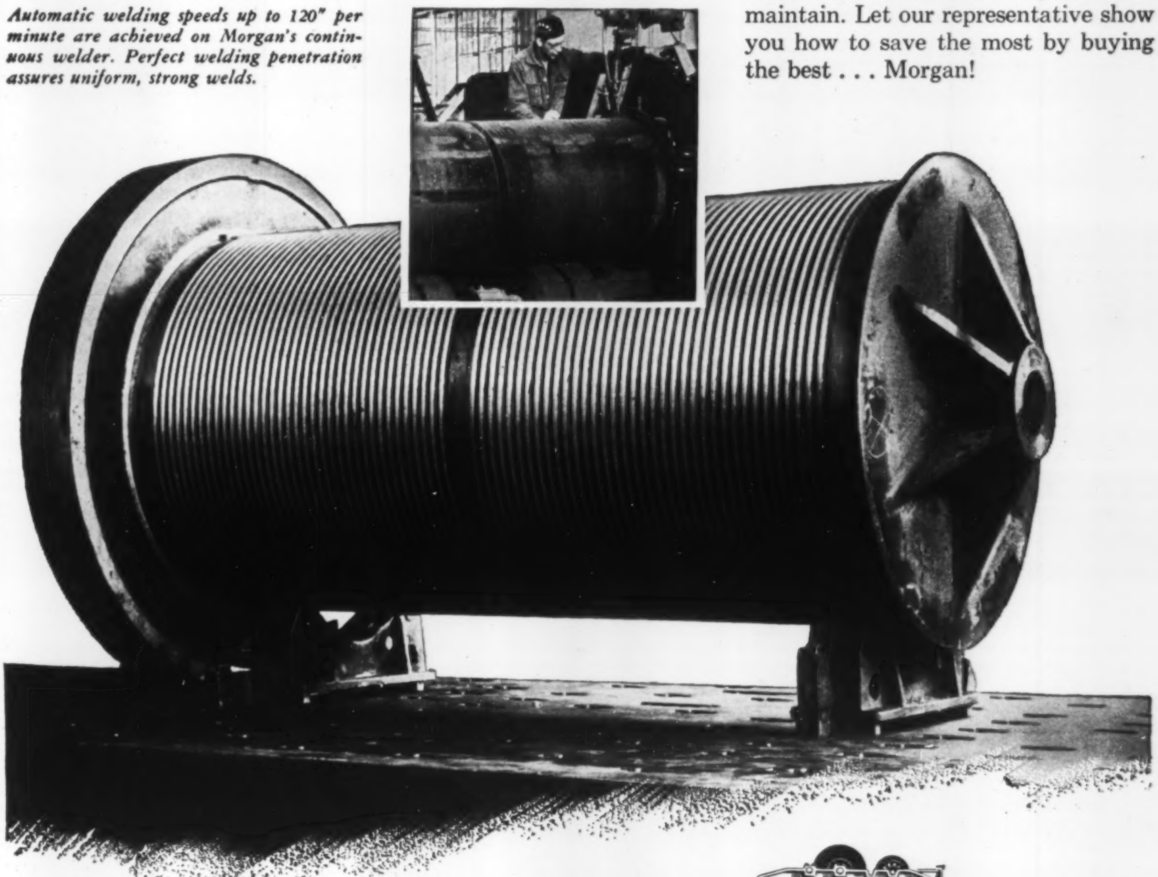
• *Fabricated drums* in Morgan cranes are structurally stronger than cast drums . . . yet they weigh less.

Automatic welding of Morgan drums with the world's largest continuous welding machine assures uniform, sound joints and seams.

Crane girders, too, are welded automatically, making them stronger and lighter. Morgan welders are qualified in accordance with A.S.M.E. and A.W.S. codes.

Performance records prove conclusively that Morgan cranes are the best in the business . . . cost less to operate and maintain. Let our representative show you how to save the most by buying the best . . . Morgan!



Automatic welding speeds up to 120" per minute are achieved on Morgan's continuous welder. Perfect welding penetration assures uniform, strong welds.

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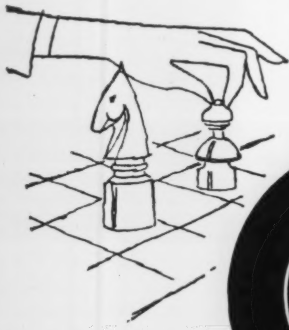

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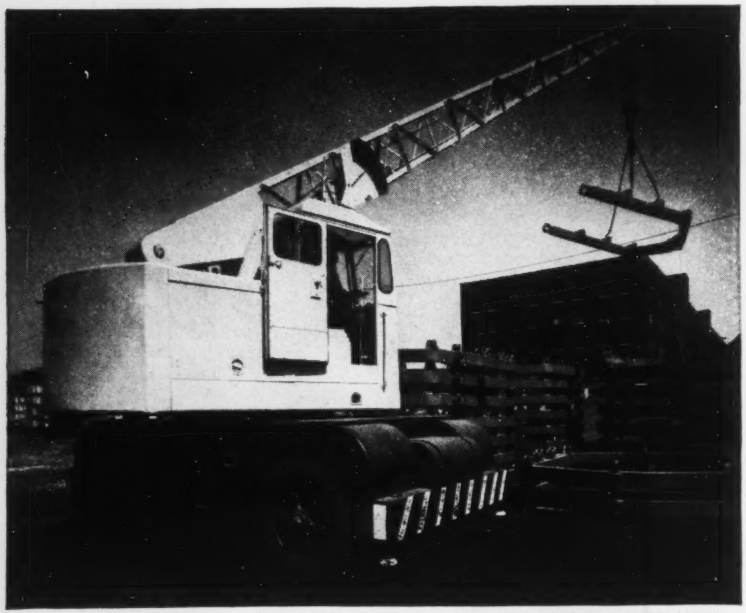


Photo courtesy of International Harvester Company's Tractor Works · Chicago, Illinois

Now, available L.P.G.- diesel- or
gasoline-electric powered in capacities
from 2 to 15 tons. Available on
long term lease arrangement, too.

H. C. BARNES
Consulting Engineer
Armco Steel Corp., Middletown, O.

pig iron and oxygen will become an important adjunct to steel production. Tests on the atomization of liquid open hearth fuels with a high velocity jet flame have shown promise.

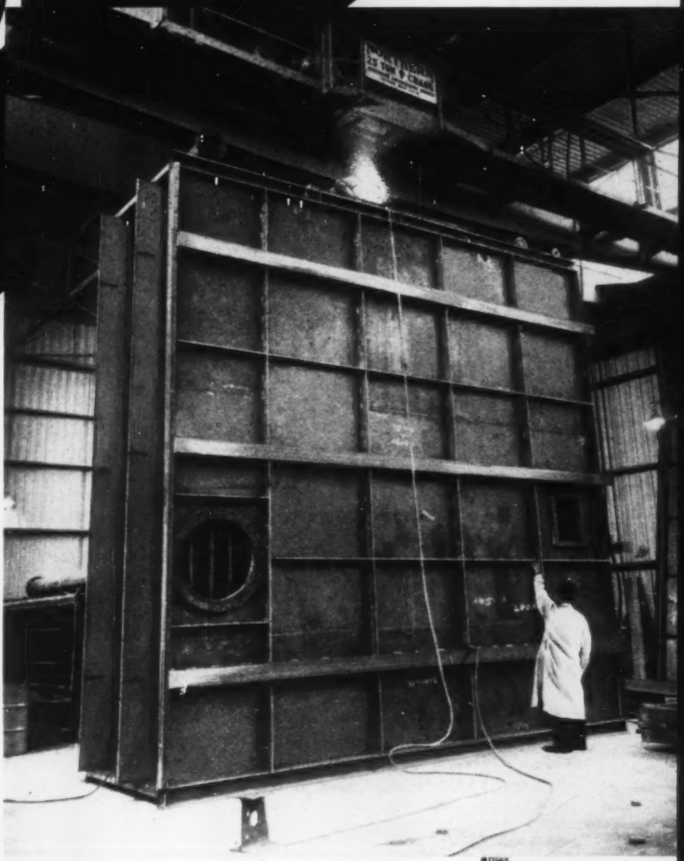
Fluidization techniques, coupled with finely divided beneficiated iron ore, low cost reducing gas and deteriorated coking coals, are spurring the development of solid-gas phase direct reduction of iron. This strikes at the economic foundations of the blast furnace. Today, there are numerous experimental installations for making sponge iron. Oxygen may play a dominant role in the production of reducing gases—hydrogen, carbon monoxide, or both.

Mr. Barnes . . .

A Swedish variation of oxygen converter process, known as the Kal-Do or K. D. process, uses a rotating converter shell, which is mounted in a tilting frame. The converter shell is rotated during blowing, providing increased contact surfaces among metal, slag and oxygen. A 30-ton converter has been in successful operation since May, 1956. It produces shapes, plates and drawing quality sheets.

The scarcity and high cost of scrap and the recent availability of fine, low gangue foreign ores in quantity have revived interest in the sponge iron processes—they produce synthetic scrap for open hearth and electric furnaces. In progress is experimental work to combine gaseous reduction with a melting process to slag off the gangue in the ore. If successful, it may become a serious competitor of the blast furnace.

Two Miles of Pipe in this FORTY-TON PACKAGE



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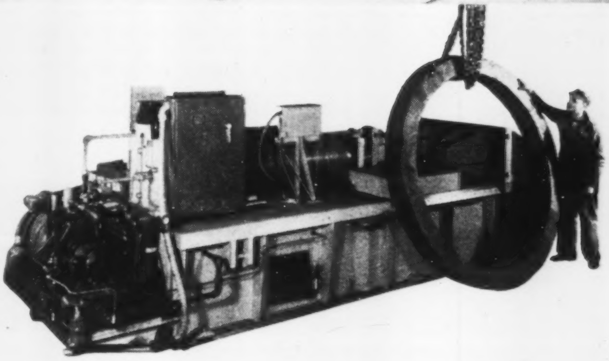
Sorry, we can't show the contents of this hefty box. It's our customer's design. But we *can* tell you each of four assemblies required approximately 10,000 lineal feet of 2″ extra heavy pipe, hydrostatically tested at 600 psi pressure. Shipment was made the McGregor-Michigan way—*on schedule*. This is one of the first sizeable jobs produced in our new Heavy Fabrication Plant which is equipped with the most modern equipment for bulkier and heavier work. Our Main Plant continues to turn out welded and riveted plate fabrications in both mild and alloy steels, such as steel mill charging buckets, ladles, furnace doors, ingot cars—chemical and petroleum processing towers, tanks, jacketed kettles—machine bases, diesel engine beds, heat exchangers, autoclaves, stacks—and an endless variety of other industrial equipment.

Something different in fabrication service is illustrated. It's our new six hundred ton horizontal press for cold-forming heavy bars, channels, conveyor rails and other structural steel members. The 67″ I.D. gear blanks shown are SAE 6150 steel, of 6″ x 6″ cross section, formed and then welded into an accurate ring. After welding, joints are cobalt-bomb x-rayed. Such equipment permits us to offer you close tolerance forming to almost any configuration with no heating or reheating (depending on nature of material), simplified dies, faster service and lower costs.

Please send prints or specifications for prompt quotation on your next fabrication job, or write for brochure illustrating our facilities and production.



New 600-ton "Bulldozer" — M-M designed and built horizontal forming press.

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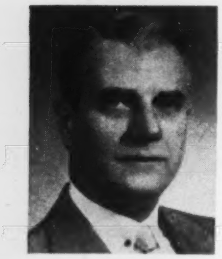
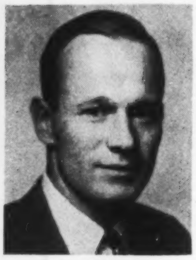
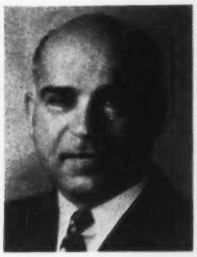


CHARLES RIETH
Manager, Nickel Sales Div., National Lead Co., New York

HOWARD I. YOUNG
President, American Zinc, Lead & Smelting Co., St. Louis



ERIC F. WEST
President, Aluminium Ltd. Sales Inc., New York



S. M. NORWOOD
Vice President, Electro Metallurgical Co., Div. of Union Carbide & Carbon Corp., New York

NONFERROUS METAL PRODUCTION

FORUM ON TECHNICAL PROGRESS

Titanium ingot capacity will be 30,000 tons by the end of this year . . . atomics, ceramics create expanding markets for lead . . . despite production increases, nickel supply will remain short . . . aluminum ingot supply is easier . . .

Mr. Rieth . . .

From all indications, nickel will be in short supply for some time to come. Current and established requirements will be expanded, and new developments will undoubtedly require substantial tonnages of this metal.

In June, 1956, National Lead Co., through an affiliated corporation, Nickel Processing Corp. of New York, opened a metallic nickel refinery in Crum Lynne, Pa. It produces about 1.2 million lb of metallic nickel monthly. The basic raw material used is nickel oxide sinter from Nicaro, Cuba. This metallic nickel, being produced in accordance with U.S. stockpile specification P-36, is highly useful for many important applications, such as nickel-alloy steels and stainless steels.

Production at Nicaro has been running in excess of 31 million lb nickel, plus cobalt, per year. With expanded facilities, which are near completion, 1957 production will reach a level of about 50 million lb per year.

Mr. Young . . .

The price of zinc should remain firm at 13.50 cents per pound as long as the government continues to purchase U.S. production for stockpile, or the Agriculture department continues to make barter trades for the world's surplus zinc. If both policies are discontinued, one of two things will occur: 1. There will be a drop in price. 2. There will be a substantial reduction in the output of metallic zinc in the Free World. Production now is in excess of consumption, and the government "take" is averaging around 15,000 tons a month.

Per capita consumption of zinc in all forms in the U.S. during 1955 reached an all-time high of 13.057 lb. This represents an increase of 24 per cent over the average of the 1947-1949 period when the figure was 10.53 lb. With the rapid increase in our population, it is reasonable to expect that per capita consumption will increase 3 to 4 per cent annually.

Mr. West . . .

In the last few months, the supply of aluminum ingots has been easier. Barring unforeseen circumstances, we expect that this improved balance of supply and demand will enable the aluminum industry to more actively pursue the development of new applications in a number of fields.

In aluminum fabricating, we foresee a quickening pulse in the development of new fabricating techniques. This trend is exemplified by the significant number of extrusion users which have installed extrusion presses and equipment. The use of self-contained continuous casting equipment linked with compact hot-rolling units will become more widespread.

We think that significantly increased tonnages will be consumed by the packaging industry, in new applications in the electrical field and in the automotive field.

Mr. Norwood . . .

Production of titanium continued its rapid climb last year. Sponge manufacturers turned out almost double the amount they made the previous year.

Sodium-reduced sponge produced at the Electromet plant in Ashtabula, O., made its appearance in carload quantities, and was used for the commercial production of both pure and alloy grades. Producers of magnesium-reduced sponge have announced plans for the addition of 7600 tons of capacity in 1957. The announcement was made that another sodium-reduced sponge plant with a capacity of 5000 tons per

SIMON D. STRAUSS
Vice President, American
Smelting & Refining Co., New York

D. A. RHOADES
Vice President & General Manager
Kaiser Aluminum & Chemical Corp.,
Oakland, Calif.

R. DAVISON
Manager, Market Development Div.,
New Jersey Zinc Co., New York

J. M. KENNEDY
Chairman, Revere Copper
& Brass Inc., New York

year will be in operation by the end of the year.

The construction of new and larger arc melting furnaces points to about 30,000 tons of ingot capacity by the end of 1957. Progress is being made in improved melting techniques both in consumable electrode furnaces and in the recently developed skull-type furnace to obtain larger and more homogeneous ingots. New rolling mill equipment, much of it designed especially for titanium, also is being installed.

Along with the confidence already noted, there is a healthy sign of increasing maturity as specific problem areas are studied. The principal ones are the development of new alloy sheet compositions and means for the increased utilization of scrap.

Mr. Strauss . . .

Lead has been replaced in some of its markets, but its total use continues to increase. Most dramatic of the newer applications is in shielding against radioactive elements. The first atomic-powered submarine, the *Nautilus,* has lead shielding. As atomic power is applied to other forms of transportation, lead will capture the greater share of this market.

Another new use is in porcelain enamels for aluminum and steel sheets, a use which may develop into major proportions in view of the trend toward commercial construction with metallic exteriors.

The two major uses of zinc (galvanizing and diecasting) are well established, but the technique of applying zinc in both fields is constantly improving. By and large, the steel industry is converting to continuous line galvanizing. In many instances, this has required the production of tailormade metal to meet the specifications of steel companies. The volume of zinc used by the diecasters was somewhat smaller in 1956 than in 1955 because of the cutback in automobile production. But look for 1957 to set consumption records.

Mr. Rhoades . . .

This year should be one of outstanding significance for the aluminum industry. Technical advances and product development work of recent years should result in important commercial breakthroughs for several new uses.

New primary metal and fabricating facilities will go into production during the year to improve the availability of the metal. This is a factor of major importance. Increasing supplies will spur the adoption of new applications and the expansion of present uses.

The 1957 cars have established a trend toward the wide-scale use of aluminum. It shows every indication of moving ahead rapidly.

Greater aluminum use is expected in these areas: Containers for food and other products, autos and architecture.

Of continuing significance is the steadily growing utilization of high-strength weldable alloys for structural applications in transportation, machinery, material handling equipment and marine uses.

Mr. Davison

The galvanizing industry continues to be the major consumer of zinc. Development of the continuous galvanizing line, together with expanded steel production, should send demands to record levels. The increasing use of zinc coated steel for building materials, air conditioning equipment and a multitude of drawn and formed products is expected to expand in 1957 as industrial and commercial construction reach new highs.

The major body changes of most 1957 cars emphasize the design flexibility inherent in the die-casting process. Many new applications of zinc diecastings have appeared in the new models: Dual headlights, air conditioning equipment, body and fender moldings, and window frames.

Diecasters are broadening and expanding their markets. New designs of frames and working parts in home appliances, business machines, portable tools and industrial equipment have greatly increased the diversification of applications in the diecasting industry.

Zinc for cathodic protection is becoming important to the marine field. Zinc anodes are finding new markets in applications for protecting submerged steel structures, pipelines, tanks and underground utility lines.

Mr. Kennedy . . .

In Revere's aluminum activities, recent emphasis has been on the further integration of its sources of primary metal. Fabricating facilities have been expanded. The trend in copper and brass fabrication has been toward the improvement of quality and the speeding up of production to offset growing costs.

Last year, we joined Olin Mathieson Chemical Corp. in the formation of a primary aluminum producing company, Olin Revere Metals Corp. We simultaneously tripled our aluminum sheet and strip capacity and

MUELLER BRASS CO. 600 SERIES BRONZE *the main working part in the smooth and* OCEAN CITY SPINNING REELS

600 Series gears prove ideal in heavy duty salt water models 300, R300, and 320 in which corrosion resistance and high strength are important.

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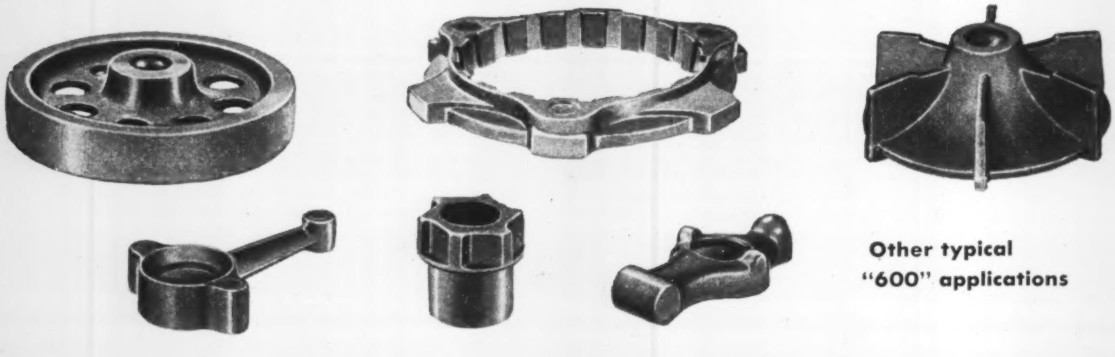
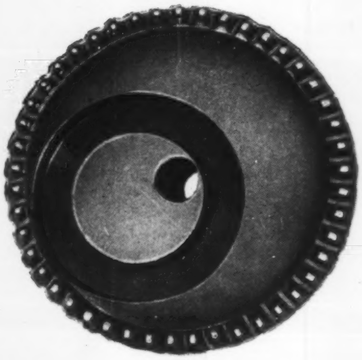


Other typical "600" applications

FORGED GEAR
powerful



The Montague-Ocean City Rod & Reel Co. of Philadelphia is proud of the fact that many fishermen are calling their famous Ocean City "300" series spinning reels "the most dependable spinning reels in America." Such praise justifies the very best components in a product—like the corrosion-resistant Mueller Brass Co. "600" alloy gear. Provides its own shaft and has an integral clutch which takes the driving force from the handle, and incorporates a cam which provides the oscillating motion of the spool for cross-winding the line. Bronze was chosen because of the need for maximum strength, long wear, and because it is such an excellent bearing material. This application dramatically points up the valuable properties of Mueller "600" series alloys.

There are countless applications of Mueller "600" series bearing alloys. Find out how you can utilize one or more of them in YOUR products. Because forgings can be made closer to the finish size in "600" series alloys than can sand castings, there is less waste, greater speed in finishing.

• WRITE TODAY FOR THE ENGINEERING MANUAL YOU NEED

Mueller Brass Co. Forgings Engineering Manual H-58565 ☐

Tuf Stuf Aluminum Bronze Alloys Engineering Manual H-58563 ☐

600 Series Bearing Alloys Engineering Manual FM-3000 ☐

Copper Base Alloys in Rod Form Engineering Manual FM-3010 ☐

MUELLER BRASS CO.
forgings
• brass
• bronze
• aluminum

METALS AND ALLOY REVIEW

by FRANK M. LEVY

Vice-President and Director of Research

Recently Ray Engelgau, who heads our statistical quality control procedures, and Amos Armitage from our machining department met in my office and we had a very interesting discussion on our new "S-C" rod. The term "S-C" is derived from the fact that it is produced from billets that are cast semi-continuously. In addition, we use the letters "S-C" to indicate its "super cutting" qualities which is one of the outstanding characteristics of this rod. We have definitely proved these qualities in some very exhaustive tests, one of which I'd like to tell you about here.

Experience has shown that it is difficult to control dimensions within close tolerances on machine parts involving internal forming operations. Amos had run into exactly that trouble with a certain hydraulic fitting made from rod that required a fairly close dimensional tolerance on the internal formed diameter. So, we decided to make a comparison test by machining the part from rod made by the conventional method and from rod produced by the S-C process. When rod made by the conventional method was machined, the parts could not be held within the specified tolerance range. The same machine, the same tooling and the same machine operator were used in this test, and when S-C process rod was substituted, the machine parts were well within the required tolerance range.

In addition, I just received a letter from a well-known equipment manufacturer who has been running tests on S-C rod. They reported that the incidence of tool trouble per 1000 forgings machined from S-C rod were approximately half that of forgings made from conventional rod. We think that is pretty good evidence that the rod made by our semi-continuous process is exceptionally uniform by all standards. Incidentally, our new billet casting department is quite a model of automation and has a number of interesting processes and features. Anytime you happen to be in our area we would be more than happy to show you through and explain the many points of this process that gives us what we firmly believe to be the best possible rod available today which of course is reflected in the quality of our forgings.

If you would like a folder that fully covers our semi-continuous process, just drop me a note and I'll see that one is sent along to you promptly. In the meantime, we'd like to have you investigate our super-cutting S-C rod because we think it will improve your product quality—and we've got the alloys to do most anything to meet the most exacting demands.

Thanks for your time.

MUELLER BRASS CO.

PORT HURON 26, MICHIGAN

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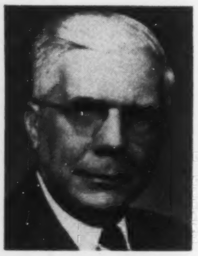
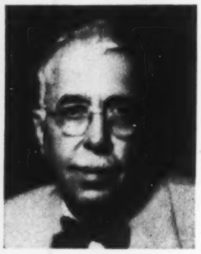
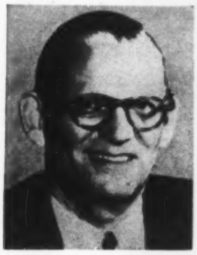


J. L. PATTERSON
General Manager-Fabricating Div.,
Aluminum Co. of America, Pittsburgh

GEORGE PERKINS
General Director, Product Development,
Reynolds Metals Co., Louisville



W. LUNSFORD LONG
President, Tungsten Institute
Warrenton, N. C.



HERMAN W. STEINKRAUS
President & Chairman, Bridgeport
Brass Co., Bridgeport, Conn.

doubled our extrusion capacity. We are adding a new welding line for aluminum tubing.

One of our important developments was a nonrusting refrigerator truck body made of extrusions and sheets. It cuts production time. Weight savings of up to 50 per cent are possible.

Tube-in-Strip, which combines hollow tubing and metal strip in a single sheet of aluminum, copper or brass, has gone through technical improvements. The size of the tubes and the gages of the material have been increased. The product has been installed in solar water heating units, and many other applications are progressing.

In copper and brass fabrication, production of billets and other shapes, such as copper and brass cake, is being stepped up through semicontinuous casting. Production of tubes has been greatly accelerated through the increased use of multiple draw benches with capacities up to 150,000 lb.

Usage of rolled printed circuit copper in the electronics industry is expanding, particularly in the production of radio and television sets, automatic computers and guided missiles.

Mr. Patterson . . .

In 1956, for the fifth year, the aluminum industry reached a record high in primary production. The total was 1.68 million tons, compared with the previous year's 1.57 million tons. Completion of expansion plans by 1958 will boost installed production capacity 43 per cent over what it was last year. Alcoa has a $600-million expansion program under way.

On the fabricating scene, eight new foil rolling mills are being installed at the Davenport (Iowa) works, and will begin operations in 1957. Additional 72-in. foil mills are being installed at the Alcoa (Tenn.) works.

A 160-in. hot mill at Davenport is scheduled for completion during 1957, and a new 100-in. cold strip mill entered production at the close of 1956.

New facilities at the Massena (N.Y.) works began producing insulated aluminum cable in the latter part of 1956.

The capacity for large press extrusions will be greatly expanded by the installation of a second 14,000-ton extrusion press at the Lafayette (Ind.) works. Increased extrusion facilities also will be installed at the Cressona (Pa.) works.

Mr. Perkins . . .

The ability and desire of new and old aluminum producers to expand production without government assistance has had a marked influence on industrial mobilization planning. Adequate productive capacity has in large part de-emphasized the strategic stockpiling philosophy.

Research and development programs have provided the industry with a multitude of new products and significant improvements in production and fabrication.

The development of improved soldering techniques supports the new uses of aluminum in electrical devices and heat exchangers. Improved alloys that are strong and corrosion resistant after welding will increase the use of aluminum in tanks, vats, process vessels, trucks, trailers and ships. Continuing research and development of heat treating and extrusion have many important aspects, including the reduction of residual stresses in severely sculptured shapes.

Architecture, transportation, and electrical markets will grow substantially. Chemical, packaging and consumer markets have expanded their use of all forms. Extruded shapes will continue their spectacular growth because of new designs and refined production practice.

Mr. Long . . .

In October, 1956, the Department of Defense canceled the quota system on tungsten. In the years ahead, we see an opportunity for the aircraft industry to use high temperature alloys with a tungsten base that may solve the problems of the "thermal thicket."

We are in an era where high temperature alloys for the 1800 to 2000° F range (or higher) must be developed. This can best be done by working with a tungsten base alloy —one that uses 50 per cent or more tungsten.

A new tungsten alloy, W1-52, has been developed. Blades and vanes for jet aircraft made of it are being tested by an aircraft engine manufacturer.

Mr. Steinkraus . . .

We must look to technology to overcome the increasing costs of pro-

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Magnesium Assn., New York

F. H. VANDENBURGH
Vice President & General Manager,
Mallory-Sharon Titanium Corp.,
Niles, O.

J. L. KIMBERLEY
Executive Vice President
American Zinc Institute Inc.,
New York

T. W. LIPPERT
Manager, Sales & Technical Service,
Titanium Metals Corp. of America,
New York

duction in 1957. Lighter gage materials with closer tolerances and superior surfaces will decrease the customers' manufacturing costs. Longer coils of strip and tubing will help fabricators to handle increased weights of material and maintain an advantage through longer runs and lower handling costs.

In aluminum, we look forward to constantly higher technical requirements of the aircraft industry. The fabrication of extrusions for automotive and architectural applications should continue to increase at a rapid rate. Aluminum alloy bus bar stock has been accepted by the electrical industry.

Bridgeport continues to do research and development work on copper and aluminum alloys and on several of the newer metals. Zirconium and uranium rods and tubing are being produced. To meet the increased speeds of new military aircraft, production will increase on the hard, heat-treatable aluminum alloys. Production of titanium will be expanded.

Mr. Singleton . . .

Accelerated acceptance and new technological developments are brightening magnesium's prospects.

Production and shipments of all classes of products were up in 1956 —production, nearly 10 per cent; mill products, approximately 14 per cent; castings, about 12 per cent. Anode tonnage is growing at a steady pace.

Announcement of a second primary producer, with some indication that this new production may "come in" before the close of 1957, was the high point of last year. While 1956 production reached only some 67,000 tons (due to the strike), it is expected to hit 80,000 tons this year.

More magnesium is being used in fabricated parts, both as components and complete assemblies. New markets in electronics, automation and material handling are growing steadily. Magnesium enjoys at least two "must" markets in alloying and metal reduction, both of which are large tonnage users, and each is growing rapidly. As the production of aluminum, titanium, uranium, beryllium, zirconium and other metals grows, the sales of magnesium must grow, too.

Mr. Vandenburgh . . .

Continuous technical improvements in titanium are accounting for a rapid build-up in production and use. Mallory-Sharon is now nearing completion of its melting plant expansion program, which will boost capacity to 500 tons a month in the first few months of 1957. Further expansion is in the offing. We expect that Mallory-Sharon will have to prepare for an output of 1000 tons a month by 1960.

Improved quality has led to the aircraft industry's reliance on titanium as a major structural metal. Carbon control has introduced better machinability. Closer control of uniformity has brought about easier formability.

New weldable, heat-treatable alloys have been developed and are being evaluated. One offers low yield strength in the annealed condition for easy formability, plus high heat treated strength. Several titanium products, such as anodizing racks and heat exchangers, have won acceptance.

Mr. Kimberley . . .

It is anticipated this will be another exceptionally good year for the zinc industry as a whole and diecasting and galvanizing specifically. The 1955 consumption record for these categories (439,000 tons, galvanizing; 405,000 tons, diecasting) may be broken.

The American Zinc Institute is winding up a major research program involving zinc anodes for cathodic protection. It is also doing research on the plating of diecastings and the use of zinc oxide in paints.

Research projects in the U.S. and abroad are being aimed at the production and use of metallic zinc which approaches 99.999 per cent purity. This may result in major new end uses. This is conjecture, but it must be remembered that successful diecasting of zinc was not practical until 99.999 per cent pure metal became available.

The industry has completed plant revisions and expansions aimed at improving flexibility in the production of the various grades required. Demands of the foreseeable future can be handled readily.

Mr. Lippert . . .

Major producers of titanium sponge have solved most of their basic production and quality problems. Current projects are concerned with the perfection of engineering details of present processes. Much research is

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ROBERT L. ZIEGFELD
Secretary-Treasurer, Lead Industries Assn., New York

being devoted to: Alternate methods of extraction and a search for cheaper starting materials. Successful results could help push prices down to fully competitive levels. But the Kroll process, or modifications of it, will probably account for most of the production for a number of years.

The most important trend in mill products is that equipment is being designed specifically for the rolling and forging of titanium. Some of it is in use. TMCA has taken a significant step in this direction by its purchase of a mill at Toronto, O. It will be rebuilt for the exclusive fabrication of alloy sheets and forging billets.

Special heating furnaces, different rolling procedures, and novel heat treating fixtures and flattening devices for large sheet are all passing through the prototype stage into full scale production machines.

Great strides are being made in the development of the metallurgy and production techniques for heat-treated alloy sheets. Strength levels are at new highs. The sizes, shapes and gages contemplated are not available in steel today.

Mr. Ziegfeld . . .

The use of lead as a radiation shielding material continues to keep pace with the growth of the atomic energy industry. At least one manufacturer has introduced a composite sheet of lead bonded to aluminum which is said to be used by the atomic industry. Last year, the storage battery industry continued its trend toward the use of arsenical alloys for battery grids.

Because of the continued growth of the chemical industry, the use of lead for chemical equipment continues to increase. Loose lead lin-

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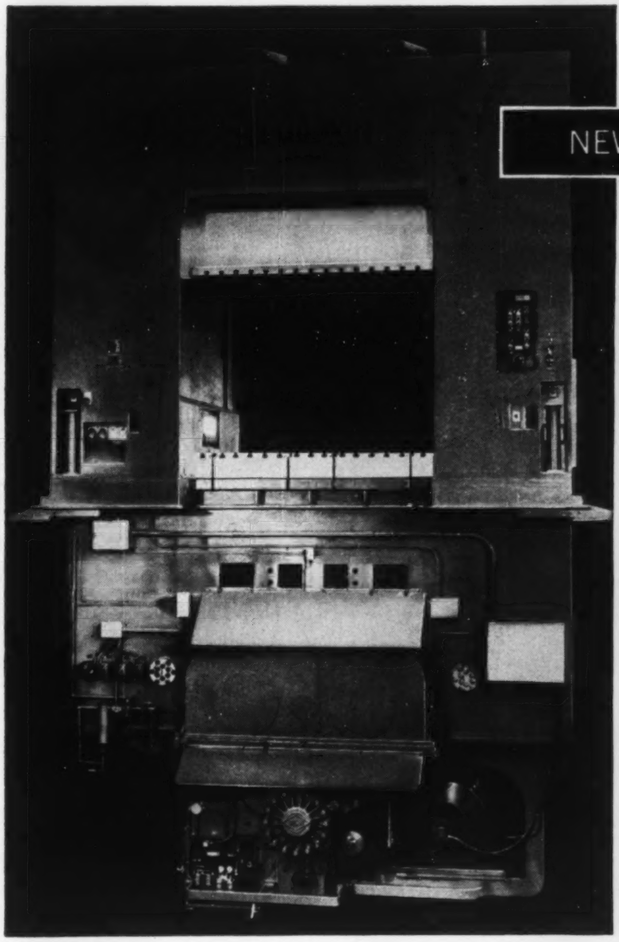

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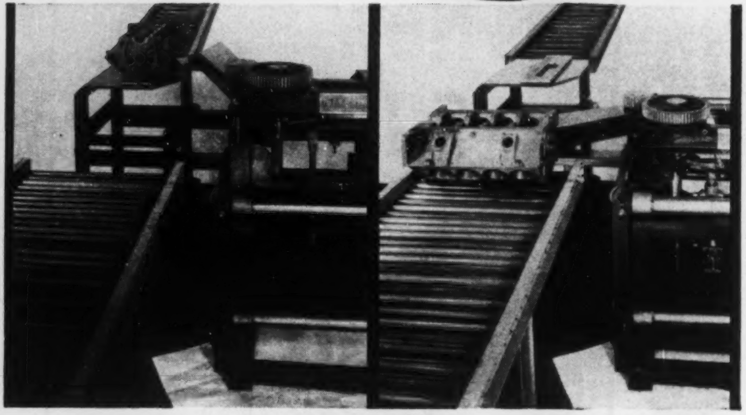
One . . .



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CONVEYORS

THEODORE E. VELTFORT
Manager, Copper & Brass Research Assn., New York

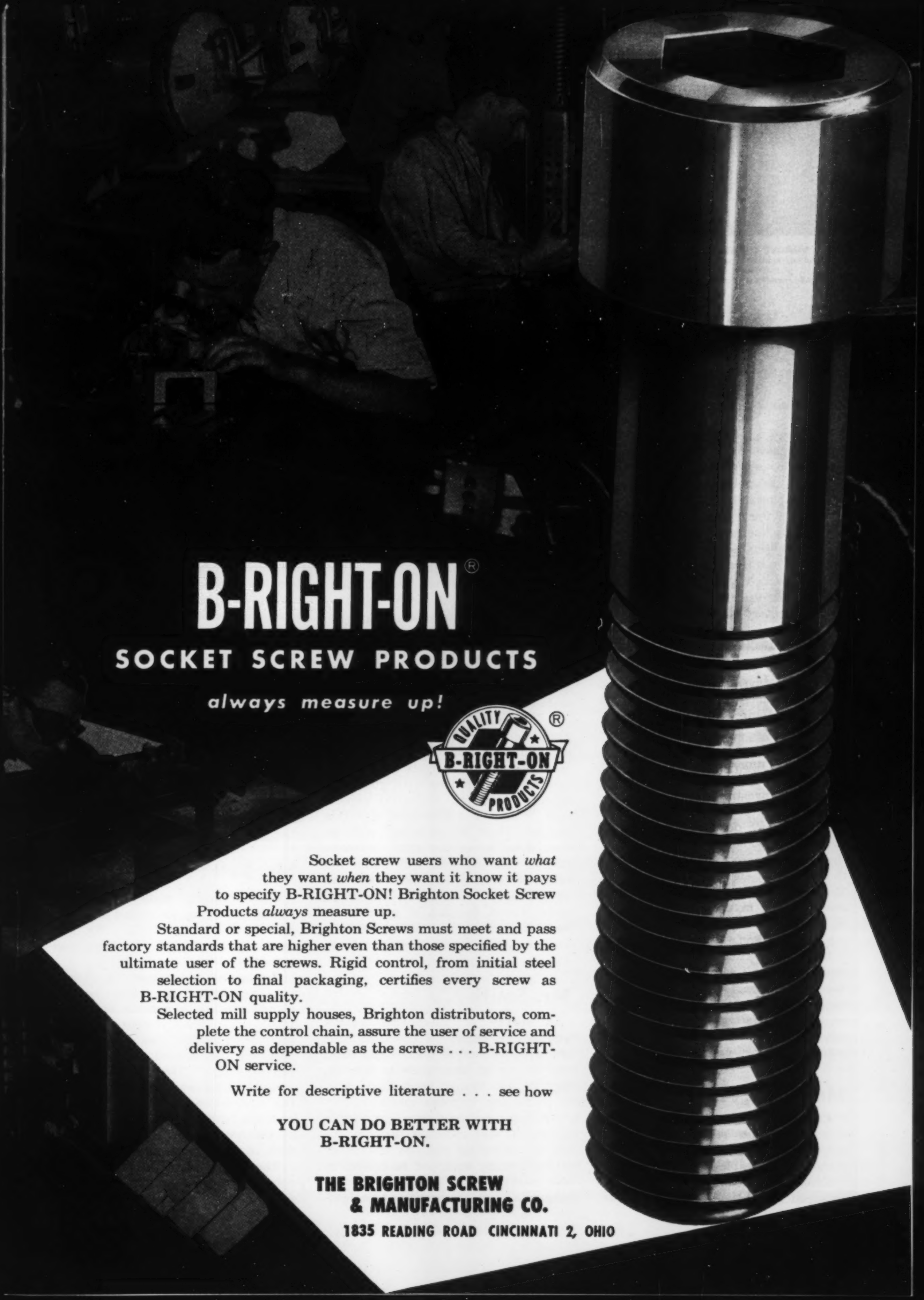
ings, bonded lead linings and brick lead linings are gaining acceptance.

The ceramic industries have become an important new outlet for lead. The high lead porcelain enamels for aluminum are enjoying an expanding market. A newer product, lead-containing porcelain enamels for steel, is being used commercially on a limited scale. Its lower firing temperatures prevent warping and reduce cost. Experimental work has been done on the addition of lead compounds to ceramic bodies.

Mr. Veltfort . . .

The broad field of application for mechanical wire is sometimes overlooked. Shipments of mechanical wire during the postwar period average about 100 million lb per year —about 5 per cent of total brass mill products shipped.

Brass mills are modernizing mechanical wire equipment. Emphasis has been on high speed facilities, lower unit costs, improved quality and greatly expanded capacity. Mechanical wire can be obtained in some 15 standard commercial copper alloys for applications in the spring, fastener, hardware, electronic and communications industries. This wire is also made in a number of special alloys where strength, toughness, resiliency to flexure or high resistance to corrosion are desired. In the future, potentially lower production costs made possible by the use of shaped mechanical wire may play a significant part in its selection and use.



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President, Investment Casting Institute

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Technical Director, Albion Malleable
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JAMES H. SMITH
General Manager, Central Foundry
Division, General Motors
Corp., Saginaw, Mich.

JACK E. BOLT
Technical Service Engineering
Phenolic Products Sales, General
Electric Co., Pittsfield, Mass.

CASTING

FORUM ON TECHNICAL PROGRESS

More foundries will mechanize . . . autos to use more pearlitic malleable . . . military still is major market for magnesium castings . . . investment casters turn out 200-lb parts . . . green sand molders improve sand compaction . . .

Mr. Lazzara . . .

New fields of application are opening up for investment castings. The aircraft industry continues to be the largest customer, but sales to commercial users are steadily increasing.

Of chief importance to the phenomenal growth of this young industry is the investment casting foundryman's ability to keep pace with the customer's demand for good delivery and lower prices. Prices for the same component average less than they did eight to ten years ago. The increasing need for this product should result in a banner sales year in 1957, with the industry approaching $175 million.

Investment casters no longer are limited to small castings. Some producers make parts weighing as much as 200 lb. What was considered to be a large casting only three years ago (say 8 to 10 lb) is now commonplace with most manufacturers.

Mr. Rote . . .

The trend to automatic transmissions and other power features requires large tonnages of pearlitic and standard malleable irons.

Several malleable foundries are equipped to produce shell cast parts, and others are moving in that direction. Several thousand tons were produced in shell molds in 1956. Indications are two to three times that tonnage will be cast in 1957.

A recently announced nodular graphitic material (produced by alloying malleable iron) has a high level of mechanical properties and can be cast in thick sections with good uniformity. Limited industrial experience indicates advantages for this material, and it probably will be used more widely in 1957. Production of this material will widen the range of section thicknesses that can be produced in malleable foundries, since it can be cast in sections at least 6 in. thick and annealed to a uniform, high strength structure.

Mr. Smith . . .

A survey of purchasing agents and design engineers disclosed that the greatest single service foundries can render is assistance in the design or redesign of products to lower costs and improve quality.

We have achieved excellent results in design and redesign through the use of our stress analysis laboratory which is fully equipped to determine the best casting design from the standpoint of strength and weight. Stresses developed in tests which simulate operating conditions are accurately measured. With this scientific approach, we have been able to design castings with less weight and greater strength—the ultimate goal.

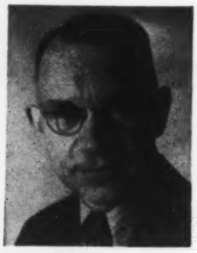
Another medium is the use of cobalt 60 radiography for improved casting design. It is possible to determine the soundness of design prior to production without using destructive testing methods.

Mr. Bolt . . .

Shell molding resin consumption should reach an estimated 20 to 25 million lb during 1957. By contrast, only 250,000 lb were consumed in 1950.

Production experience and increasing competition in shell molding should produce a number of process innovations aimed toward still lower production costs. The major objective will be toward more efficient use of resins. Two approaches are already under way. One is the growing application of resin coated sand and the other is through the use of coarser sands where casting surface is not paramount.

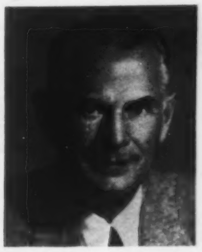
The resin coating of sand constitutes by far the greatest development activity. Four techniques are



M. E. BROOKS
Foundry Engineer, Magnesium Dept.
Dow Chemical Co., Bay City, Mich.

T. E. EAGAN
Chief Research Metallurgist
Cooper-Bessemer Corp.
Grove City, Pa.

CHARLES K. DONOHO
Chief Metallurgist, American Cast
Iron Pipe Co., Birmingham



L. G. VANDERHOOF
Vice President & General Manager,
Stewart Die Casting Div.
Stewart-Warner Corp., Chicago

used now. They use heated or room temperature sands with liquids or dry resins. Efforts are directed toward simplification of resin application and equipment development for use in the foundry.

The application of hollow shell cores to dry and green sand and permanent mold production will contribute heavily to process acceptance. Stack molding, utilizing contoured shell mold backs, is increasing.

Mr. Brooks . . .

Major markets for magnesium sand and permanent mold castings continue to be military, particularly aircraft and missiles. Casting requirements are getting more complex.

Plane and missile makers are specifying thinner walled castings with better surfaces, improved internal qualities and faster delivery. A major trend seems to be developing in permanent mold castings for missile parts. Here, the important requirements are extremely high quality; simple, rather static, design; and volume production. Because they are generally of better quality than diecastings, and more adaptable to volume production, permanent mold castings fit these requirements. Still wider markets for them in the missile field can be expected.

Mr. Eagan

Gray iron development has advanced more along the production front than the metallurgical. High production foundries have introduced more automation, along with more use of the CO_2 process and shell molding. Better sand and sand control have been introduced, with a trend toward the synthetic type.

On the metallurgical side, more emphasis is being placed on the introduction of closer control over metal melting and handling, as well as more use of inoculation to produce better grades of iron.

Startling advances have been made in the production and melting of nodular iron. Two patented processes have been announced. Perhaps the greatest advance was the development of pressure injection of metallic magnesium in Europe. With special ladles, this process is employed successfully. It has considerable merit because it eliminates objectionable fumes produced by the introduction of magnesium alloys in open ladles, and it is claimed to produce nodular iron at a much lower cost. The main objection to it: It is somewhat slower to handle in the foundry.

Mr. Donoho . . .

Gray iron can be used with all the newer high productivity foundry methods. Long the highest tonnage metal for centrifugal casting, it also is a favorite for shell molding and for casting in CO_2-water glass molds and cores.

Important applications for cast irons with spheroidal graphite—nodular or ductile irons—are continuing to develop at an expanding rate. There is constant improvement in the efficiency and economy of alloying gray iron with magnesium and/or other nodulizing elements.

Injection methods applied to molten iron may substantially modify compositions and resultant properties. Various additives are made effectively in a stream of nitrogen through a graphite tube. Granular calcium carbide is most often the base additive or carrier. By these methods, carbon content can be substantially increased, sulphur lowered almost to the vanishing point and nodulizing agents effectively added. So several different and useful types of gray iron can be produced simply and effectively from a single base metal.

Mr. Vanderhoof . . .

Improved die-casting alloys for product use and equipment are undergoing operating tests. Others still on the board or farmed out in research laboratories are equally as promising.

No longer harnessed with limitations of size and design, the end product of our industry now ranges from the minutely small to the large, intricately designed casting for difficult functional services.

Mr. Lansing . . .

The Naval Research Laboratory has completed a study of the notch ductility of malleable iron. It shows that properly made malleable irons are inherently notch ductile and suitable for low temperature applications. Compared with tonnage steels, standard malleable irons retain notch ductility to lower temperatures than do the steels, while pearlitic malleable with comparable notch ductility may be made.

On the elevated temperature side, stress rupture data are being developed as part of the Malleable

JAMES H. LANSING
Technical & Research Director,
Malleable Founders' Society, Cleveland

C. V. NASS
Vice President & General Manager,
Beardsley & Piper Div.
Pettibone Mulliken Corp., Chicago

Founders' Basic Properties Research at Purdue University. To date, these have compared favorably with results of tests of materials considered competitive with malleable iron.

New applications of pearlitic malleable are developing. A pearlitic malleable crankshaft is used in one automobile. Automatic transmissions continue to use a large number of pearlitic malleable castings. Conversions to malleable will continue with greater use of stress analysis studies pointing the way to most effective design.

Mr. Nass . . .

The foundry industry and the foundry equipment industry will need more technically trained men and will be in strong competition with other fields for the engineering experience necessary to keep the industry progressing.

Further mechanization and automation will require a greater degree of technical knowledge at the departmental supervision level and for the maintenance of the improved and more complex machinery.

It will be necessary that the industry accept its share of responsibility for the training of engineers, and personnel for foundry super-

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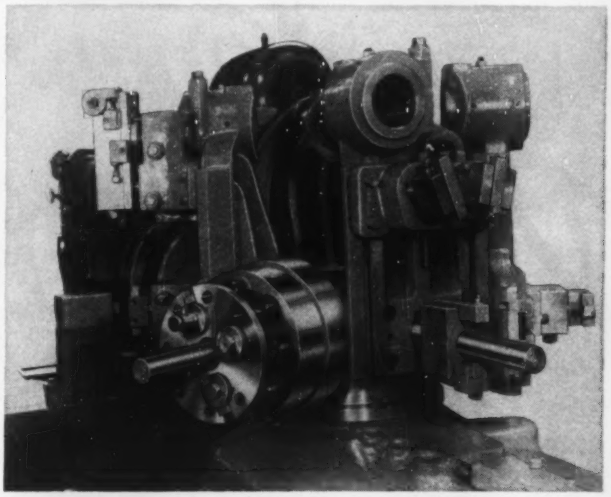

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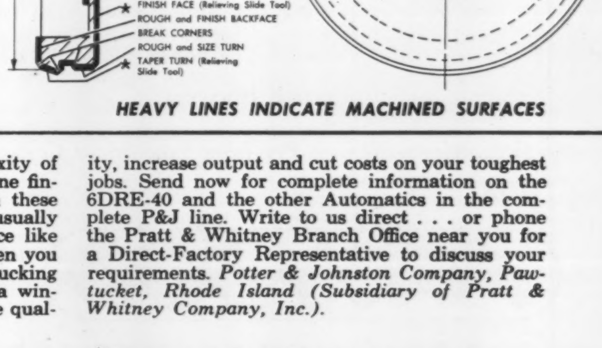
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RAY SUTTER
President, Sutter Products Co.
Holly, Mich.

vision. Courses which are shorter, more intensive and more technical than those offered by our colleges could be the answer.

Mr. Seavoy . . .

The movement toward the complete mechanization of the foundry continues. In addition, the industry is putting substantial sums into capital investments to improve general working conditions.

In ferrous melting operations, there is growing interest in water-cooled cupolas, operation with basic lining, increasing use of equipment for preheating the air blast, and duplexing of the hot metal to provide grades which meet stringent specifications.

It is the responsibility of foundry equipment manufacturers to recognize these trends, then implement their research and development programs to supply machinery which will meet industry's demands.

Mr. Sutter . . .

Advanced know-how in the building of shell making equipment is making it possible to genuinely attack the cost problem.

It is now possible to visualize ma-

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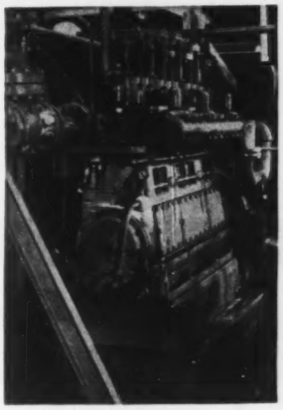

Four 5" stroke Aldrich Direct Flow Pumps on die casting service in a midwestern metalworking plant. These pumps are handling 250 gpm at 1500 psi.

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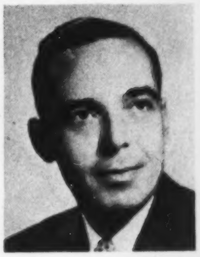


J. D. ZAISER
President, Ampco Metal Inc.
Milwaukee

L. J. WISE
Vice President, Chicago Malleable
Castings Co., Chicago
President, Malleable Founders' Society

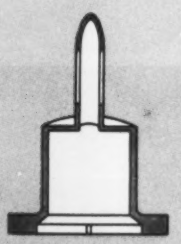
chines that will produce shells whose sizes and intricacy of detail were only dreamed of. Product engineers are thinking in terms of castings that could not have been made with other foundry methods.

Laboratories are producing better resins at reduced prices. Additional cost saving will be achieved through improved sand coating techniques and sand reclamation methods. When used with the already well developed manufacturing methods for shell molding, they will definitely step up the use of resin made shells.

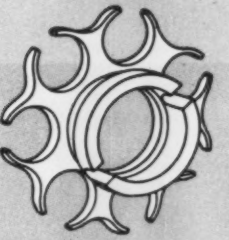
Mr. Zaiser . . .

To solve the skilled worker scarcity and the need for increased tonnage production per man-hour, equipment manufacturers are developing many relatively small and inexpensive units for bringing a degree of mechanization to even the four and six-man shops. A corollary advantage of such equipment is increased quality of output through the greater consistency of mold making which is inherent in machine operation. Similarly, new methods such as the CO_2 process of coremaking and shell molding, reduce time and labor.

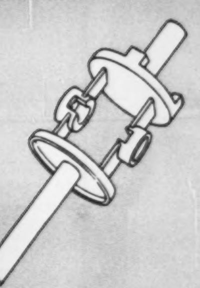
High production work for large quantities of castings, as well as the larger number of heavy castings re-



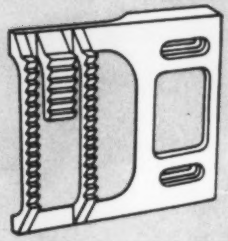
Here is an example of the complex internal coring possible with investment casting. Square, round, elliptical or irregular interiors can be cast.



The complexity of this part makes investment casting the only feasible method of manufacture. Prongs have perfect dimensional accuracy.



Here an entire assembly incorporating multiple functions is cast in one unit. "Keyhole" coring and a number of distinct surface details are required.



The sharp teeth of this sewing machine feed dog were cast in wear-resistant alloy to give longer wear than could be obtained from machinable material.

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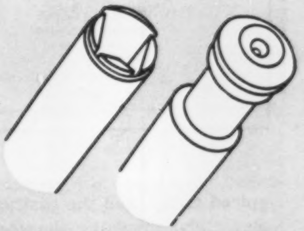
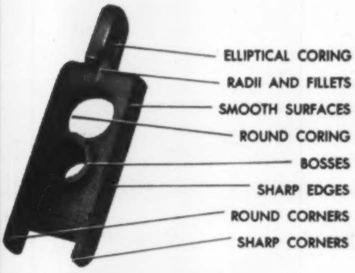
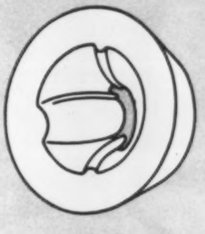
See not only what you can do, but what costly, time-consuming operations Austenal investment casting eliminates.

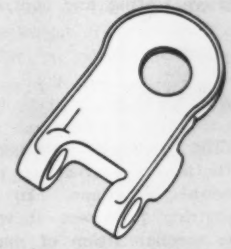


Cross-sections of irregular and varying thickness can be utilized. In this part the internal core diminishes from an irregular square to a small round hole.

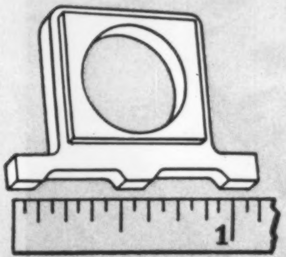




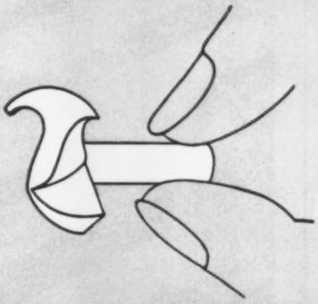
These extrusion dies of wear-resistant alloy are readily mass-produced with highly complex and irregular internal contouring.



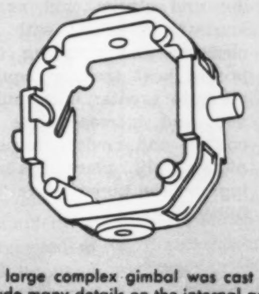
Walls of varying cross-sections are possible. Here wall thicknesses change from thin to very heavy, allowing strength without bulk.



This very small part measures 1⅛" wide and less than ⅛" thick. Its thinness, rigidity and detail were possible only by investment casting.



Shown here is an example of how investment casting can virtually eliminate hand-filing and machining by keeping uniform, intricate detail.



This large complex gimbal was cast to include many details on the internal and external surfaces.

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JOHN B. CAINE
Foundry Consultant
Cincinnati

quired today, and the casting of complex alloys involving the use of small carefully controlled quantities of special additives, continue to be largely concentrated in a relatively small number of large brass and bronze foundries. These units, whether captive or commercial, have progressed well toward mechanization and extensive testing and control methods.

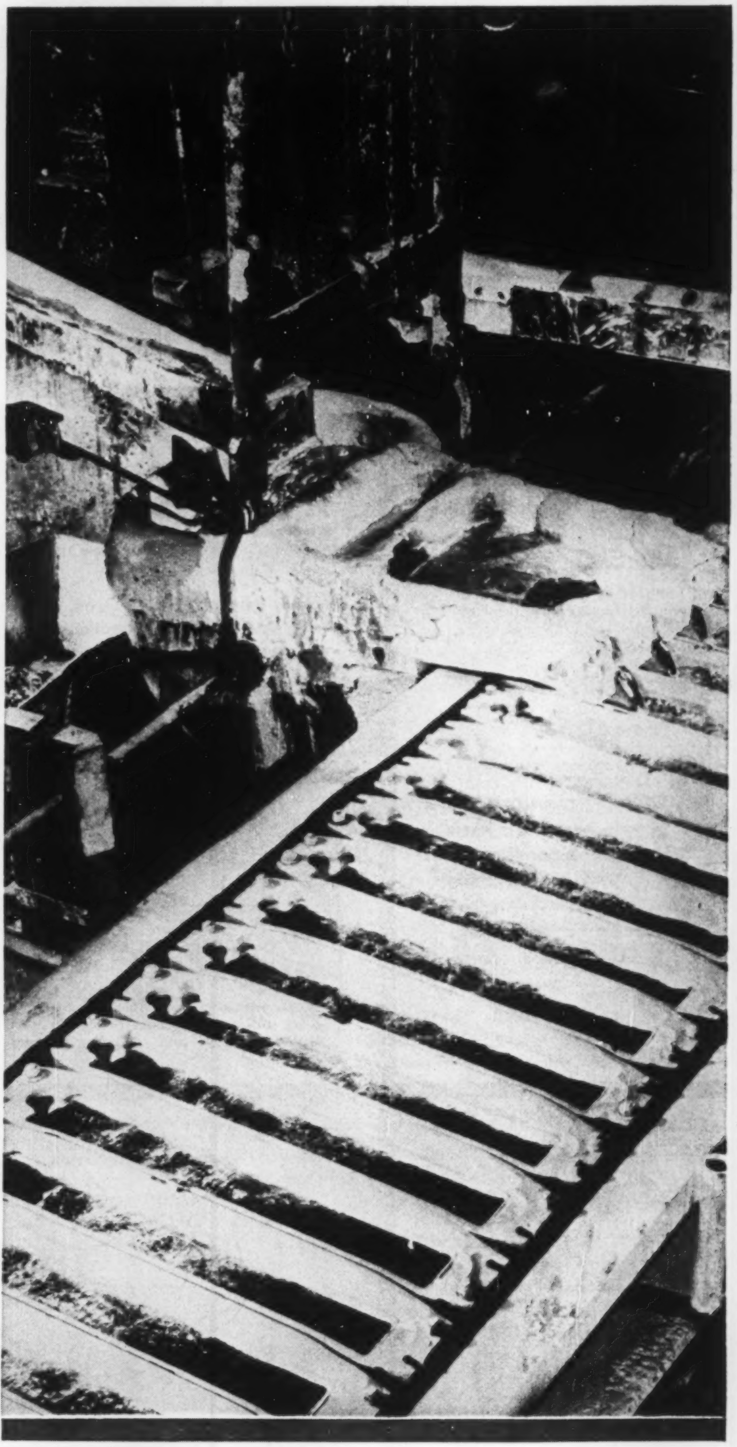
Mr. Wise . . .

The malleable castings industry will make substantial progress in several directions. In its manufacturing processes, it will increase the mechanization of material handling, molding sand conditioning and transportation; molten metal transportation and pouring; castings shakeout; heat treatment and finishing.

New techniques, such as shell molding, the CO_2 process, pressure molding and others, will produce more accurate castings, with savings in cleaning and finishing cost. Improved heat treating equipment will promote greater uniformity of product, and increased use of quality control and modern inspection techniques will place malleable castings on the highest level of dependability.

Mr. Caine . . .

Work on the compaction of sand has uncovered information that will enable old-fashioned green sand molding to compete with the newer processes. It has shown that green



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HARRY M. ST. JOHN
Foundry Consultant,
Ft. Pierce, Fla.

sand molding, if properly understood, can be used to produce castings which approach shell molded castings in smoothness and dimensional accuracy. Smooth, accurate castings can be produced with the economies and flexibility of green sand molding.

No new materials, techniques or equipment are needed, with the possible exception of molding machines which are larger than those in use today. They're needed to compact the sand, which must be capable of being compacted to densities approaching the maximum. Closer controls, which are taken for granted with the newer processes, also are needed.

Mr. St. John . . .

All foundries are interested in mechanization, but only the largest will find it practical to invest heavily. Probably the production of no nonferrous foundry, captive or jobbing, is sufficiently large and nondiversified to approach the complete automation which some of the iron and steel foundries are installing. But all foundries will endeavor to reduce their labor costs with labor-saving equipment. Any foundry can afford to condition sand by mulling and mechanical aeration. Molders will be relieved of all duties except mold making. One-man pouring will become more usual.

Even foundries with widely diversified production will try to operate with one molding-sand mixture for all metals. It has been shown that even aluminum can use a sand suitable for the copper alloys.

Federated Aluminum Alloys always conform to published Performance Specifications

If you have had reason to doubt the performance capacity of certain aluminum alloys, it will pay you to consult Federated before you re-design or substitute another metal.

Often the performance requirements of a part indicate that a certain aluminum alloy will do the job; yet in operation, the part fails. Costly re-design or a more expensive metal are usually relied upon to rectify the trouble.

All aluminum alloys should provide the characteristics set for them in published specifications. At Federated's three aluminum plants, rigid quality control insures that production ingot adheres exactly to specified content. Impurities are held at or below the minimum allowable percentage.

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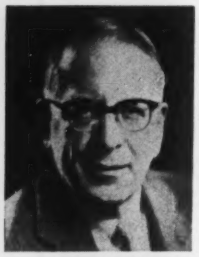

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F. L. LaQUE
Vice President, International Nickel Co. Inc., New York

W. B. PIERCE
Vice President-Sales
Allegheny Ludlum Steel Corp. Pittsburgh

MATERIALS AND METALLURGY

FORUM ON TECHNICAL PROGRESS

Trend toward extremes in use of metals accelerates . . . new chrome-nickel-manganese stainless is catching on fast . . . more hot work die steels will be used for aircraft parts . . . vacuum metal capacity to double this year . . .

Mr. Hardy . . .

The future looks exceedingly bright for the newest nickel conserving grades of stainless steel—types 201 and 202. The main reasons: They compare favorably in corrosion resistance with stainless alloys in the 300 series and fabricate as readily. They cost about $45 a ton less.

The corrosion resistance of 202 is equivalent to 302 in mildly corrosive environments. It is being used in railroad cars, truck trailers and restaurant equipment, and for architectural and decorative applications. Research is being conducted on its suitability for use in the chemical and petroleum fields where corrosion is severe.

I forecast that type 202 stainless will be found to perform satisfactorily in 85 per cent of the applications in which 302 is being used.

Mr. Fitch . . .

Rather than specify 18-8 for all applications, users are now basing their specifications for stainless steel on the actual end use. They can take advantage of such grades as 430, a nonnickel bearing type which will do the job in 50 per cent of the cases where 18-8 was formerly specified. This practice makes more nickel available for defense and offers another advantage to the user: In sheet form, 430 is $216 a net ton cheaper than 18-8.

Supplies of 430 are adequate to meet any increase in stainless demand and will be an important factor in the continued growth of the stainless market, which historically has doubled every ten years. The new 200 series, a lean nickel-bearing type of stainless, will also find increased use as designers tighten up their specifications and apply the right grade for the job.

Mr. LaQue . . .

A dominant feature during 1956 was the continuing trend toward extremes: Extremes of purity in germanium and silicon used in transistors; extremes of dimensions and tolerances for gage and flatness in the extra wide, long thin stainless steels which are precipitation hardened, and titanium for aircraft and missile structures; extremes in strength of new alloy steels which provide tensile strength with good ductility above 300,000 psi, and heat treated plates which take advantage of the superlative properties of tempered martensite in welded vessels and other structures; extremes of temperature and pressure in the new supercritical steam power plants which require alloys to withstand high stresses and high temperatures for periods that are extreme when compared with requirements in jet engines.

We can anticipate that these extreme requirements will be met, and they will become the commonplace of tomorrow.

Several elements once in short supply, such as columbium, are freely available. Continued and increasing diversions from the stockpile, plus forthcoming additions to production capacity will ease the nickel situation to the point where planning can be based on the expectation of an adequate supply.

Mr. Pierce . . .

The chromium - nickel - manganese alloys, which comprise the 200 series of stainless steels, are rapidly establishing an enviable position in many diversified applications.

One of the most successful uses of Type 201 has been for truck trailer and rail car structural parts and sheathing, where it is being used strictly on its own merits in competition with Type 301. In the annealed condition, 201 has appreciably higher strength than 301. In the various cold-rolled tempers, the duc-

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CHARLES T. EVANS JR.
Vice President, Technology &
Development, Universal-Cyclops
Steel Corp., Bridgeville, Pa.

tility at a given strength level is superior to that of 301 in some fabricating operations.

The high temperature properties of Type 202 also present interesting possibilities. The tensile and stress rupture strengths up to 1200°F are from 20 to 40 per cent higher than those of 302.

Bulk milk coolers have been made from 202, and it has proved to be entirely satisfactory in fabrication and service. Welding presents no problem. Types 201 and 202 are being successfully applied in virtually all the uses where 301 and 302 have formerly been so successful. In many cases, they have been found to have definite advantages.

Mr. Roberts . . .

During 1956, metallurgists and designers working to extend strength levels at which steels could be used in aircraft realized that a grade long used in the tool and die industry had many of the properties they were seeking.

Developed by Vanadium - Alloys Steel Co. in the early 1930s, and sold under the trade name Hotform, it contains about 0.4 per cent carbon, 5 chromium, 1.5 molybdenum and 0.5 vanadium. Modifications (containing variations in carbon, tungsten, vanadium or nickel contents) are available as forgings, bars and sheets for the fabrication of aircraft structural elements.

The outstanding characteristics of this material are its high ductility over a wide range of temperatures (−100°F to 1000°F) and its high strength up to 1000°F. Between 400 and 900°F, it has the highest strength-weight ratio of any commercial structural metal.

Heat treated to tensile strengths of 260,000 to 310,000 psi the metal has advantages over lower alloy materials, such as modifications of 4340, because its tempering temperature is high. A large measure of stress relief is possible. Combine that factor and its air hardenability, and you have a natural for rapid extension into aircraft parts in 1957.

Mr. Overacker . . .

Vacuum induction melting capacity for steel and high temperature alloys will double in 1957. Ingot sizes will be increased to give fabricating economies. The largest induction unit in operation produces 3000-lb ingots. Design on a 5-ton unit is under way.

Arc melting capacity will increase tenfold to handle increased titanium and zirconium production. Skull melting, which produces homogeneous multiconstituent alloys and utilizes scrap without double melting, will displace the cold mold consumable electrode method. The first commercial scale titanium skull melting installation will go on stream this year.

Vacuum heat treating to remove hydrogen from titanium, zirconium, uranium and their alloys will be expanded. The economy, safety and bright surface produced by vacuum annealing are attracting processors of more conventional metals.

Mr. Post . . .

Technical advances in three areas —nuclear energy, electronics and jet propulsion—will make more exacting demands on the steels needed.

The characteristics and fabricating qualities of materials used for atomic equipment need improvement. Pinhole corrosion or the most infinitesimal leak cannot be tolerated, since failures cannot be repaired in the presence of radiation. As progress in electronics continues to pace the growth of automation and miniaturization, there will be greater demand for improved magnetic and electrical properties in high nickel steels.

The trend toward jet engines that will operate at least 300 to 500°F higher (up to 2100°F) will mean greater production of heat resisting steels by vacuum melting. Much has been done to improve the hot ductility of stainless forging billets. I also foresee increased use of carbon tool steels for cold heading in view of recent improvements that give more uniform cross-sectional properties.

Mr. Evans . . .

Vacuum melting is developing rapidly. Several 2000-lb induction vacuum melting units are in production, and consideration is being given to the design of furnaces with capacities up to 10,000 lb. A major use is the making of forging stock for jet engine turbine buckets from nickel or colbalt-base alloys which are high in titanium and aluminum, such as M-252 or Waspaloy.

It has been demonstrated that this type of melting gives a superior charging material for precision castings made from similar alloys, such as GMR 235. We can expect to see several new furnaces installed for this purpose this year. Improved results are obtained when the small remelting furnaces for making the castings are also operated under vacuum

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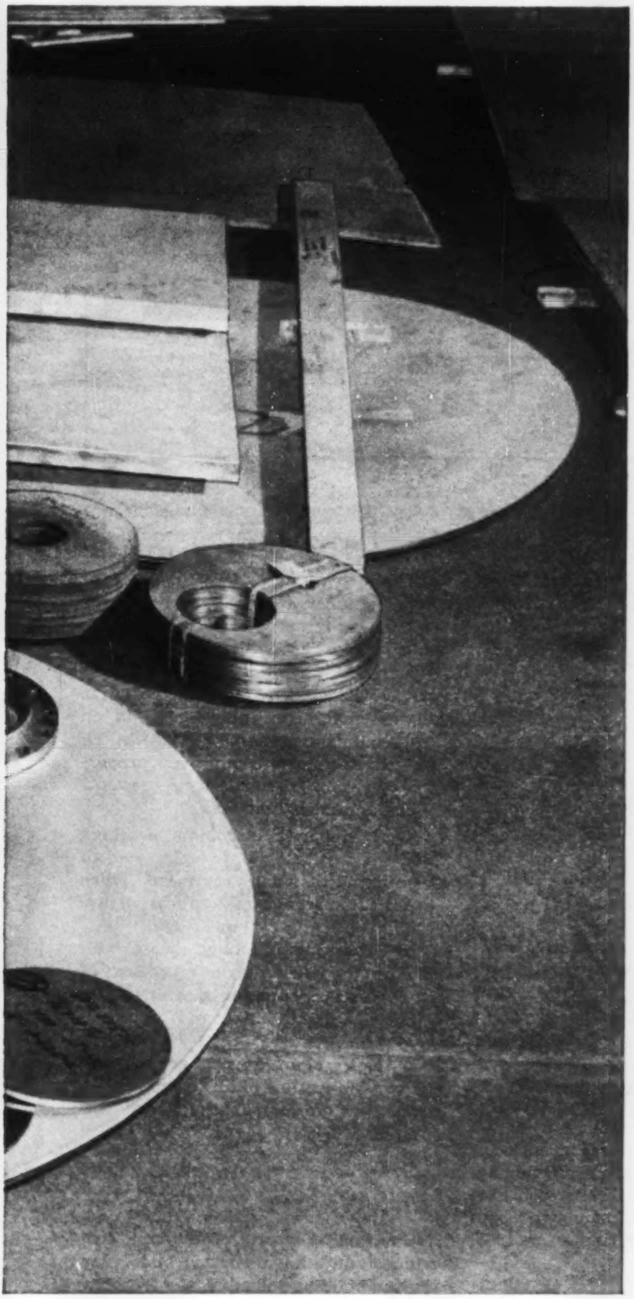

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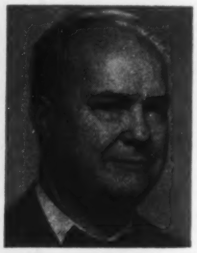

C. E. NELSON
Technical Director, Magnesium Dept.
Dow Chemical Co., Midland, Mich.

J. R. WILLARD
Sales Engineering, Aluminum Co.
of America, New Kensington, Pa.

or under an inert gas, such as argon.

Consumable electrode arc remelting of steel under vacuum is becoming important in making gas turbine disc forging stock. Ingots of improved structure up to 20 in. in diameter are being made in substantial production, and new furnaces are being installed to make 24 in. ones. The principal grades are A-286 and Discaloy. It is probable that this method, starting with air melt electrodes, will also be applicable to some of the bucket alloys, such as M-252.

There is a strong possibility that the combination of induction vacuum melting with consumable electrode arc remelting will prove justifiable for some of the new alloys with combined titanium and aluminum in the range of 5 or 6 per cent. This situation should be considerably clarified this year.

Mr. Dalrymple . . .

Changes in steel bars and billets during 1957 may result mainly from the trend toward higher speed. Look for lighter sections which are highly stressed, particularly in aircraft. Applications will require steel of high strength and stability at the elevated temperatures produced by atmospheric friction. To provide this combination of properties, aeronautical engineers are taking a look at the hot work type of tool steels to supplement the alloy constructional steels.

Industry is planning more extensive use of cold extrusion. This is creating a rapidly growing market for bars and billets with a high degree of internal and external soundness.

The need for faster and more efficient metal cutting in making automatic machined parts is increasing the consumption of resulphurized and/ or leaded carbon and alloy steel bars. The use of these additives has been extended on a trial basis to certain grades of tool steel to provide faster machining of dies and other tools.

Mr. Moore . . .

Major steels now produced by vacuum melting are 52100 and its modifications, chromium-molybdenum and chromium - molybdenum - tungsten grades for engine bearing applications. Field tests on several other uses show promise.

A big development: One steel company has started large tonnage production of the jet engine wheel alloy, A-286, in the consumable electrode vacuum arc remelting furnace. The product has higher ductility and a better structure than the air melted metal. Its price is between the air melted and vacuum induction melted product. Other producers are carrying on exploratory work on vacuum arc melted products. It's probable that at least two of them will begin operating production units in 1957.

Mr. Nelson . . .

The future looks extremely promising for magnesium. Here are some of the brightest prospects:

1. Higher strength extrusions are available. A new higher strength temper (T51) has been developed for the ZK60A extrusion alloy. Alloy ZK60XB, made from pellet stock, now is extruded in volume at Dow's Madison (Ill.) mill. It provides higher compressive yield strength in large cross sections.

2. Giant magnesium extrusions are on the way. Examples are 28 in. structural shapes, 20 in. integrally stiffened sections and 24 in. OD tubing.

3. High-temperature, magnesium-thorium alloys will find expanded structural use in supersonic aircraft and missiles. HK31A, Dow's first high temperature alloy, now is on full commercial basis. HM21SA-T8 sheet, which offers improved properties, is being evaluated by several plane and missile makers.

4. High purity aluminum coatings for magnesium alloys promise to eliminate galvanic corrosion when practical methods of application are found.

5. Magnesium tooling plate will find vastly wider markets because of its lightness, superior machinability, dimensional stability and competitive price.

6. Magnesium anodes are halting ballast tank and hull corrosion in ships. More applications are expected.

Mr. Willard . . .

Consumption of aluminum continued on the upswing last year. In the building industry, the trend toward multistory aluminum-clad structures is expected to continue. Tonnage requirement for building panels, residential siding, windows, doors, awnings, venetian blinds and other applications are predicted to triple by 1965.

The transportation field has seen more aluminum going into high-speed, lightweight trains, truck trailers and busses. In 1956, the nation's automobiles contained an average of 35.2 lb of aluminum each. For the long run, an average of

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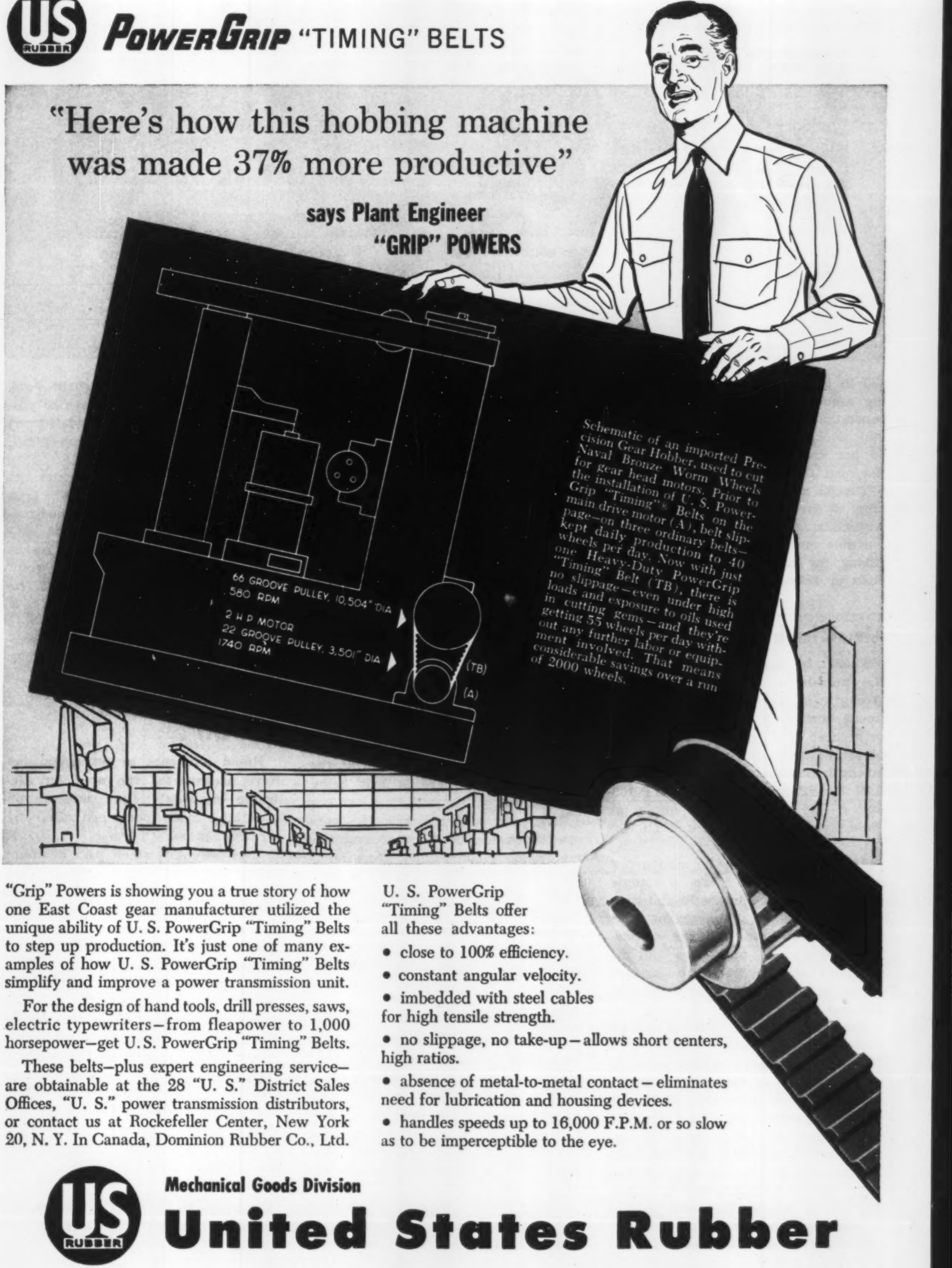

Schematic of an imported Precision Gear Hobber, used to cut Naval Bronze Worm Wheels for gear head motors. Prior to the installation of U. S. PowerGrip "Timing"® Belts on the main drive motor (A), belt slippage—on three ordinary belts—kept daily production to 40 wheels per day. Now with just one Heavy-Duty PowerGrip "Timing" Belt (TB), there is no slippage—even under high loads and exposure to oils used in cutting gems—and they're getting 55 wheels per day without any further labor or equipment involved. That means considerable savings over a run of 2000 wheels.

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- close to 100% efficiency.
- constant angular velocity.
- imbedded with steel cables for high tensile strength.
- no slippage, no take-up—allows short centers, high ratios.
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T. F. OLT
Director of Research, Armco Steel
Corp., Middletown, O.

300 lb is not unreasonable. Growing amounts are being used in the superstructures of ships. Containers and packages are expected to use 80 per cent more aluminum within the next four years.

The oil and gas industry is beginning to develop substantial markets. Aluminum products include pipe for portable and permanent lines, coiled tubing for many uses and heat exchanger tubes.

Mr. Clark . . .

There is increasing demand in the petroleum industry for higher strength steels for tubing, casing, liners, and drill pipe. This is due to greater depth of wells and higher pressures encountered. These higher strength materials are recognized in API Specification 5A as grades P-105 and P-110, which have a minimum yield strength of 105,000 and 110,000 psi.

These products may be used under severe conditions. Since a single failure in a string is costly and may be hazardous, it is important that tubing should be as uniform as possible in physical properties and dimensions and be free from surface flaws, internal defects and residual stresses.

A steel (designated C-105-A) which meets the requirements more readily than 4145 and does not have as much critical nickel as 4340 has been developed. It contains about 1.25 per cent manganese and less than 0.75 per cent of each of these elements: Chromium, nickel, silicon and molybdenum. Conventionally used section sizes develop a hardness of about 45 Rc on air cooling and require a minimum tempering temperature of 1100°F to give a minimum yield of 110,000 psi.

Mr. Hollomon . . .

Recent advances in materials for aircraft applications illustrate the tremendous gains possible when the metallurgist understands and utilizes the principles of alloy design and chemical control. In 1952, austenitic turbine buckets operated at about 1500°F; by 1957, this temperature may be raised to between 1650 and 1700°F. This rate of rise is about twice that for steam turbines, which has been considered outstanding.

With greater emphasis on the high temperature materials and special alloys for atomic energy, we can expect refractory metals, such as molybdenum, tungsten, columbium and chromium, to become more important. The behavior of some of these metals is not well known; the metallurgy of others is just being worked out.

Last year, scientific principles were used in the development of magnetic materials. New magnets were made from extremely fine particles of iron. They developed properties nearly equal to alloys containing large amounts of nickel and cobalt. Several years from now, they may well replace these alloys.

Mr. Jackson . . .

Nickel remains in short supply, but consumers are learning how to stretch stocks. Cobalt, once considered a critical element, is becoming plentiful. An Information Center has been set up to expand its uses. Columbium is also more plentiful, and the molybdenum picture is bright.

New high-temperature alloys will soon be on the way. A new molybdenum base alloy that will withstand a stress of 40,000 psi, at 2000°F, for 1000 hours is now leading the field. Recent developments in ways to protect molybdenum from oxidation at these high temperatures look promising.

Some of the more spectacular developments of last year were: 1. A new cold-finished steel with good machinability, a yield strength of 135,000 psi, and excellent fatigue resistance. 2. A zirconium-copper commutator alloy which permits electric motors to operate up to 500°F. 3. Cast iron with addition of up to 0.10 per cent tin for improved wear characteristics and better resistance to hot checking.

Mr. Olt . . .

Rapid advances in jet propulsion have accentuated the need for airframe materials that will retain strength under heat generated by air friction.

High strength steels and titanium alloys are the only materials that currently satisfy these requirements. Among the high strength steels, the precipitation - hardening stainless types have gained broadest acceptance.

Full utilization of the 200,000 psi minimum tensile strength of these steels has required basic changes in the design of aircraft structural components. Honeycomb sandwiches and integrally stiffened skin structures fabricated from thin PH stainless steels are the basis for future airframe design. In the missile field, they are useful for airframes and high pressure fuel tanks.

While the 600 to 900°F strength properties of 17-7 PH stainless are considered adequate for immediate needs, future aircraft involve still higher operating temperatures. To

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B&W Refractory Castables for Metal Working Furnaces

	Temp. F	PROPERTIES	TYPICAL APPLICATIONS
B&W Kaocast	3000	High resistance to spalling and slag attack. Low volume change and negligible reheat shrinkage.	Soaking pit covers, linings of high temperature heating and forging furnaces, burner blocks, electrode linings of electric furnace roofs, linings of non-ferrous metal furnaces.
B&W Kaocrete 32	3200	High strength, exceptional refractoriness, unusual volume stability, excellent resistance to spalling.	Can be used in applications similar to those of B&W Kaocast and where higher refractoriness is required.
B&W Kaocrete D	2500	Sufficient strength and hardness to withstand abrasion, considerable physical abuse and erosion.	Aluminum melting furnaces, linings and car tops in heat treating furnaces, as well as in sections of a wide variety of furnaces that are subject to scraping by hand tools or other mechanical abuse.
B&W Kaocrete A	2600	Resists reducing atmospheres. Has good resistance to erosion, abrasion and thermal shock.	Annealing furnace bases and other applications where resistance to reducing atmospheres is essential. Also as a general purpose castable for linings in medium temperature service.
B&W Kaocrete B	2300	Has an adhesive plastic texture particularly suited for vertical or overhanging constructions. Excellent for plastering.	Patching linings and baffles and for any application where plastering rather than gunning or casting is required.
B&W Kaocrete LI	2700	High alumina content, exceptionally high strength for resistance to abrasion and erosion.	Aluminum furnace linings where high alumina content is important.
B&W Kaolite 20	2000	Offers castable's fast, low cost installation plus insulation. Has refractoriness, light weight and low heat conductivity and, in addition, will resist reducing atmospheres. Can be poured or gunned.	Aluminum melting, heating and heat-treating, annealing and forge furnaces. Also for general maintenance and patching.
B&W Kaolite 22	2200	Has the same properties as B&W Kaolite 20. Can be used for higher temperatures but not in reducing atmospheres.	

Send for your copy of B&W Bulletin R-35. It gives additional information on B&W's versatile refractory castables.

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THE BABCOCK & WILCOX CO.
REFRACTORIES DIVISION
GENERAL OFFICES: 161 EAST 42ND ST., NEW YORK 17, N.Y.
WORKS: AUGUSTA, GA.

B&W

R551

YOU GET more* WHEN
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YOUR Bunting®
DISTRIBUTOR

*more availability

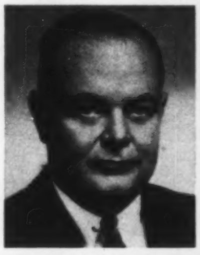
IN A MATTER OF MINUTES—at any time—wherever you are—you can get a few or thousands of completely finished Stock Bearings and Bars made of Bunting Cast Bronze or Bunting Sintered Powdered Oil-filled Bronze. All over America Bunting distributors carry ample stocks of these highest quality products made in both of the two universally popular metals, backed by Bunting's long experience and established responsibility.

Your Bunting distributor is listed in the classified section of your directory usually under Bars—Bronze, and Bearings—Bronze. Two modern Bunting factories and eleven Bunting Branch Warehouses expedite distribution in all areas. Write, or ask for catalogs giving complete dimensional listings and technical data.

All Bunting Sintered Bronze Bars are machined to size on OD for quick and true chucking; the size is stamped the full length of the bar. Both are exclusive Bunting features.

Bunting | BUSHINGS, BEARINGS, BARS AND SPECIAL PARTS OF CAST BRONZE AND POWDERED METAL.

The Bunting Brass and Bronze Company • Toledo 1, Ohio • Branches in Principal Cities



K. D. MANN
President
Firth Sterling Inc., Pittsburgh

M. F. GARWOOD
Chief Materials Engineer
Chrysler Corp., Detroit

satisfy these demands, more highly alloyed precipitation-hardening steels are being developed.

Mr. Mann . . .

Further advances in high temperature materials will be seen this year. Jet engines must operate at higher temperatures to propel aircraft at higher speeds. Increased air friction will require the use of high strength alloys in frame, skin and structural parts to resist the weakening effects of temperatures in the 800 to 1200°F range.

The use of superalloys will greatly increase because of wider application in new models and expanded production of current engines.

The rapid development of nuclear reactors will require new and more suitable zirconium alloys.

Mr. Garwood . . .

We see an expanding use of those materials which are most compatible with new processing methods and give a good combination of physical properties in the finished product. We feel there will be an increase in the functional use of metals that possess good castability and can sup-

Fellows

THE PRECISION LINE

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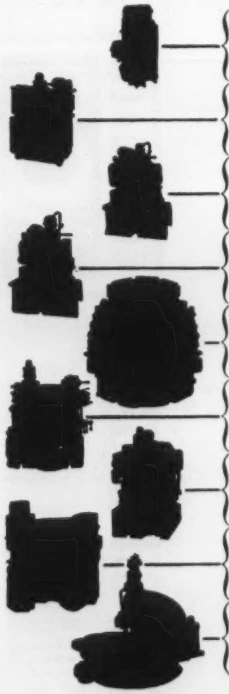
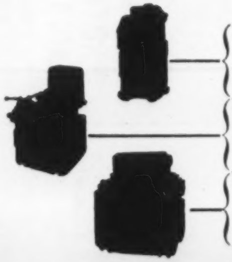
FROM 1/16" TO 120" CAPACITY



	SPUR AND HELICAL	EXTERNAL & INTERNAL	MAX. PITCH DIAMETER	MAX. DIAMETRAL PITCH	MAX. FACE WIDTH	MAX. STROKES PER MIN.
3" FINE-PITCH	both	yes	3 inches	40 steel, 30 brass	3/4" ext.	2000
No. 4GS	both	yes	6 inches	5/7 spur, 6 hel.	2"	635
7-TYPE*	both	yes	7" spur, 6 1/2" hel.	6 spur, 6/8 hel.	1 1/2" ext., 1" int.	450
7A-TYPE	both	yes	7" spur, 7" hel.	5/7 spur, 6 hel.	2" ext., 2" int.	450
No. 10 ROTARY	both	yes	12 inches	3/4 spur, 5/7 hel.	3" ext., 3" int.	500
6A-TYPE	both	yes	18 inches	3/4 spur, 5/7 hel.	5" ext., 3" int.	300
No. 12GS	both	yes	12 inches	3/4 spur, 5/7 hel.	4" ext., 4" int.	550
36-TYPE	both	yes	36 inches	3 spur, 4/5 hel.	6" ext., 6" int.	300
120-INCH	both	yes	120 inches	2 spur, 4 hel.	8" ext., 8" int.	148

*Max. P.D. internal—5 1/2"

SHAVING MACHINES



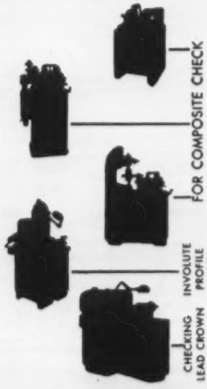
	SPUR AND HELICAL	EXTERNAL & INTERNAL	MAX. PITCH DIAMETER	MAX. DIAMETRAL PITCH	MAX. FACE WIDTH	MAX. SPREAD OF CENTERS
No. 4 FINE-PITCH	both	ext. only	4 inches	20	1 inch	12 inches
No. 8 "FULL-TOOL"	both	yes	8 inches	4	2 1/2 inches	**
No. 11 INTERNAL	both	int. only	***	6	1 1/2" up to 10p; 1", 12 to 16p	***

Also 12", 18" and 24" machines for externals only.

**Depends upon work-holding fixture

***Depends upon design of gear

INSPECTION INSTRUMENTS



		SPUR AND HELICAL	EXTERNAL & INTERNAL	MAX. PITCH DIAMETER
FOR COMPOSITE CHECK	No. 4 FINE-PITCH RED LINER	both	yes	4 inches
	No. 8M RED LINER	both	yes	***
	No. 20M RED LINER	both	yes	18 inches
INVOLUTE PROFILE CHECK	No. 12M INVOLUTE MEASURING	both	yes	12 inches
CHECKING LEAD CROWN & TAPER	No. 12H LEAD MEASURING	both	yes	12 inches

Nos. 24M Involute and 24H Lead Measuring Instruments with capacity of 24 inches

***Depends upon design of gear

In addition to the machines listed above, Fellows builds special-purpose equipment for production of gears and related items. Descriptive literature, as well as specific technical data and price information, will be gladly supplied by your Fellows Representative. WRITE, WIRE or PHONE any Fellows Office!

THE FELLOWS GEAR SHAPER COMPANY, 78 River Street, Springfield, Vermont
Branch Offices: 1048 No. Woodward Ave., Royal Oak, Mich. • 5835 West North Avenue, Chicago 39
150 West Pleasant Ave., Maywood, N. J. • 6214 West Manchester Avenue, Los Angeles 45

WE DON'T STOP WITH THE DELIVERY OF A CHEMICAL—

we put it to work and keep it working effectively

The chemical treatment of metals and metal parts—to prepare them for further processing, to protect them, to beautify them—has grown from a haphazard operation to a highly technical one. Supplying the chemical ingredients is a relatively simple job. Putting them to work and keeping them working effectively in your plant demands the skill of an experienced organization. We have that organization.

We supply not only the metal-treating chemicals, but also—free of charge—the technical and engineering service to keep them working at top efficiency. We furnish assistance in developing and installing the process, we maintain continuing inspection of the process and equipment if you so desire, we check samples of the processed metals in our Quality Control Laboratories—all these are part of the ACP service at your command.

That's why we say, "We don't stop with the delivery of a chemical—we put it to work and keep it working effectively." And we have been doing this for over 40 years. Write for a booklet describing ACP products and services.

Some of the many ACP processes and chemicals used in the treatment of metals

PAINT BONDING

Granodine® forms a phosphate coating base on iron and steel products—provides an excellent bond for paint, and greatly improves the corrosion resistance of the paint system.

Alodine® forms an amorphous film on aluminum which protects the metal and anchors the paint finish. Alodized aluminum meets service specifications.

Lithoform® promotes a good bond for paint on galvanized iron, zinc and cadmium plated surfaces. Also prevents any objectionable chemical reaction between applied paint film and the metal surface. One grade of Lithoform, in itself, provides excellent corrosion resistance on zinc and cadmium.

PROTECTION FOR FRICTION SURFACES

Thermoil-Granodine® forms a manganese iron phosphate surface which materially reduces wear and minimizes galling by eliminating metal-to-metal contact. It is particularly effective during break-in period of bearing surfaces.

RUSTPROOFING

Permadine®—a zinc phosphate coating chemical—forms a heavy oil-adsorptive crystalline coating on steel. Bonds paint or such rust-inhibiting oils as Granoleum®.

Thermoil-Granodine®—a manganese iron phosphate coating chemical—forms on steel a dense crystalline coating which, when oiled or painted inhibits corrosion.

IMPROVED DRAWING AND COLD FORMING

Granodraw® for steel, Granodraw SS for stainless, and Alodine® for aluminum for an integral coating with the base metal which facilitates the cold mechanical deformation of the metal, improves drawing characteristics and lengthens die life.

A pioneer in the development and servicing of metal treatment processes

AMERICAN CHEMICAL PAINT COMPANY Ambler 19, Pa.

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NILES, CALIFORNIA

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WINDSOR, ONTARIO

CHEMICALS
ACP
PROCESSES

R. E. PARET
Committee of Stainless Steel Producers
American Iron & Steel Institute
New York

ply a wide range of physical properties, such as pearlitic malleable and ductile irons. Some applications here are cast crankshafts, flanges, transmissions, rear axle gears, wheel hubs and possibly connecting rods.

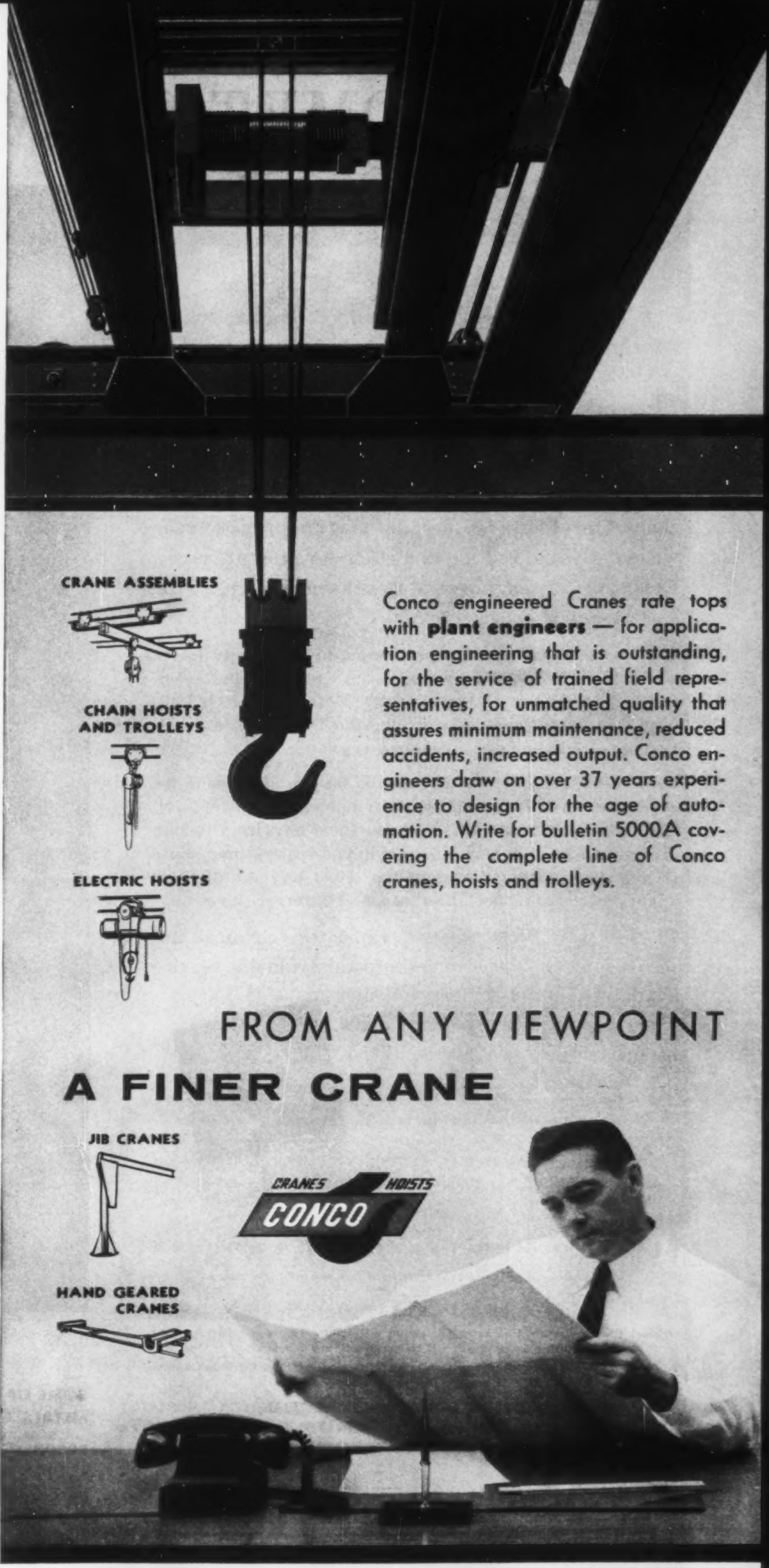
We expect an increase in the use of carbon and low alloy steels in cold extrusions. This is particularly true in applications where the physical properties given by the forming operation can be used to advantage, along with the excellent finish and good dimensional tolerances.

Recent developments in metal joining, particularly in arc welding, make possible high speed fabrication of weldments containing material combinations which were formerly considered impractical.

Mr. Paret . . .

Production of stainless steel in 1957 may reach a new high, despite nickel shortages. In the near future, demands from the aircraft industry for these heat and corrosion resistant metals could exceed today's total production. The auto industry is increasing its use of stainless trim. In chemical and other process fields, industrial growth is calling for new and better equipment, which is operated at higher temperatures and pressures than ever before. It requires more stainless.

Among the technical developments of this year should be the evolution of additional specialized grades in the 200 series. We possibly may see an industry-wide adoption of a low-carbon chromium - manganese type. Other technical developments will include development of the specialized hardenable grades of austenitic



CRANE ASSEMBLIES

CHAIN HOISTS AND TROLLEYS

ELECTRIC HOISTS

Conco engineered Cranes rate tops with **plant engineers** — for application engineering that is outstanding, for the service of trained field representatives, for unmatched quality that assures minimum maintenance, reduced accidents, increased output. Conco engineers draw on over 37 years experience to design for the age of automation. Write for bulletin 5000A covering the complete line of Conco cranes, hoists and trolleys.

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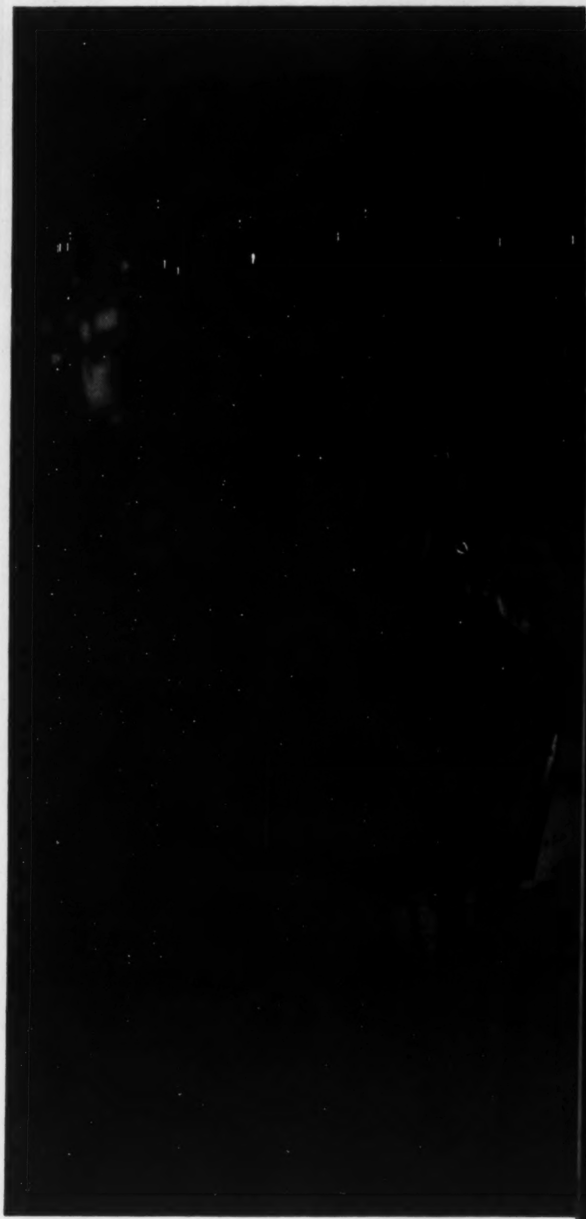
ELECTROMET SERVICE MAKES



ELECTROMET makes available many technical services to help metal producers make the most effective use of alloys.

Experienced ELECTROMET engineers work hand-in-hand with steel melters, iron foundrymen, and nonferrous producers in the selection and use of alloys and alloying materials. Their consultation service includes furnace techniques and melting operations as well as casting, rolling, and other forming practices. ELECTROMET's engineers always have recourse to the vast technical experience of:

One of the largest metallurgical research laboratories in the world. More than 300 skilled research scientists, engineers, and technicians at ELECTROMET's Metals Research Laboratories work constantly to provide technical data and assistance on all phases of metallurgy.

Some of the best-qualified advisers on the use of alloys in the country. Electric furnace, open hearth, and foundry specialists from ELECTROMET's Metallurgical Service Division draw on years of experience to help you resolve immediate technical problems or present the latest findings of their advanced work in specialized areas of interest to you.

In this way, ELECTROMET translates technical improvements and discoveries into an invaluable service available to all customers—a bonus when you buy ELECTROMET's quality products.

ELECTROMET
FERRO-ALLOYS AND METALS

Get all the facts about ELECTROMET's products and services. Write for our catalog, "ELECTROMET Ferro-Alloys and Metals."

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METALS DO MORE ALL THE TIME
...THANKS TO ALLOYS

Electromet
Trade-mark

The terms "Electromet," "EM," "Mansiloy," "Mantemp," "Simplex," "SM." and "SMZ" are trade-marks of Union Carbide and Carbon Corporation.

SOME OF THE MORE THAN 100 DIFFERENT ALLOYS AND METALS AVAILABLE FROM ELECTROMET:

BORON—Ferroboron, Manganese-Boron, Nickel-Boron, Boron Carbide.

CALCIUM—Calcium-Silicon, Calcium-Manganese-Silicon, Calcium Metal, Calcium Boride.

CHROMIUM—38 Chromium Alloys including SIMPLEX Low-Carbon Ferrochrome, Low- and High-Carbon Ferrochrome, Exothermic Ferrochrome and Silicon-Chrome, Foundry Ferrochrome and Ferrosilicon-Chrome, Charge Chrome,

THE DIFFERENCE!

Experienced ELECTROMET engineers are always ready to assist customers in the selection and use of alloys and metals for the production of steel, iron, and non-ferrous metals.

Electrolytic Chromium Metal, Chromium Briquets.

COLUMBIUM—Ferrocolumbium, Ferrotantalum-Columbium.

MANGANESE—13 Ferromanganese Grades, MANSILOY Alloy, 3 Silicomanganese Grades, Electrolytic Manganese Metal, Silicomanganese and Ferromanganese Briquets, MANTEMP Ferromanganese.

MOLYBDENUM—85% Molybdenum Powder.

SILICON—28 Silicon Alloys including Regular and Low-Aluminum Ferrosilicon, Silicon Metal, Silicon Briquets, "SMZ" Alloy, Magnesium Ferrosilicon, Barium-Silicon.

TITANIUM—Titanium Metal Sponge, Ferrotitanium, Silicon-Titanium, Manganese-Nickel-Titanium, Aluminum-Titanium, 70% Ferrotitanium (Boron-Bearing).

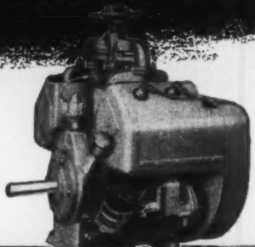
TUNGSTEN—Ferrotungsten, Tungsten Powder, Calcium Tungstate, Ammonium Paratungstate, Self-Reducing Tungsten.

VANADIUM—Ferrovanadium, Vanadium-Aluminum, Vanadium Oxide (Fused), Sodium Polyvanadate, Ammonium Metavanadate.

ZIRCONIUM—2 Zirconium-Silicon Alloys, Nickel-Zirconium.

Your customers get...
PERFORMANCE that stands out
STAMINA that stands up

when you specify
WISCONSIN Heavy-Duty
Air-Cooled ENGINES



Whether you design and build farm or construction machinery, oil-field or railway-maintenance equipment, truck refrigeration units, irrigation pumping units, or any of the many other types of equipment that depend on engine power, you're always *right* when you rely on Wisconsin Heavy-Duty Air-Cooled Engines.

Supplied in a 3 to 36 hp. range, you get the power unit that matches the input requirements of your job *and* machine precisely. Your equipment is powered for peak performance and efficiency — without *underpowering* or *overpowering*.

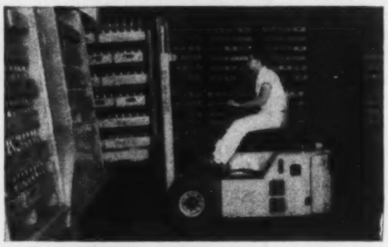
And Wisconsin basic High Torque design provides the dependable load-carrying Lugging Power that keeps the job moving through the shock-load pinches as well as maintaining a high power level under constant-load, continuous operation.

Rugged, inbuilt Stamina is another basic characteristic of all Wisconsin Engines because of their heavy-duty design and construction in all details, including such features as tapered roller bearings at BOTH ends of the crankshaft; rotary type high tension *outside* magneto; pump-circulated lubrication even on the smallest models . . . plus efficient AIR-COOLING at all temperatures from low sub-zero to 140° F.

When you specify Wisconsin Engine Power your good judgment is backed by over 2,200 Wisconsin Authorized Service Stations in the U.S. and Canada and in 82 foreign countries. Write for "Spec." Bulletin S-195 and tell us about your power problem.

● Farm Service

● Construction Service



● Material Handling

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WISCONSIN MOTOR CORPORATION

World's Largest Builders of Heavy-Duty Air-Cooled Engines

MILWAUKEE 46, WISCONSIN

CARROLL W. LUFCY
President, Dynacor Inc.
Kensington, Md.

M. J. DAY
Vice President-Research & Development, Crucible Steel Co. of America, Pittsburgh

stainless for aircraft and high neutron-absorbing grades for the atomic energy field.

Mr. Lufcy . . .

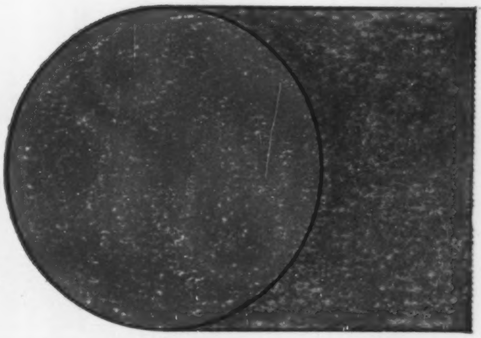
Interest in high permeability magnetic cores of all types is growing. Military requirements are being bolstered by a marked increase in industrial uses.

Manufacturers and users are working toward standardization of components and specifications, and major advances are expected here this year. It's expected that computers, magnetic amplifiers and special transformers will continue to be the major markets.

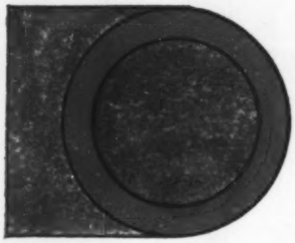
Mr. Day . . .

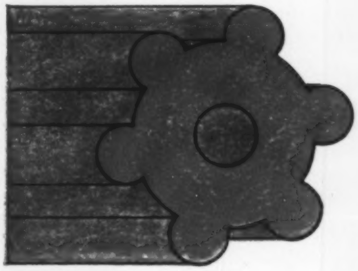
High quality alloys continue to be in exceptional demand. Research is directed toward novel metallurgical techniques and purer metals or alloys. Much work remains to be done on materials for nuclear power projects.

New substances that can absorb tremendous kinetic energies per unit area in brake or clutch applications are required by jet aircraft and heavy construction equipment. Develop-



Replace expensive heavy-duty bronze with low-cost Continuous-Cast Asarcon 773





Continuous-Cast ASARCON 773 Bronze (SAE 660) is a low-cost, readily available replacement for many "heavy-duty" bronze parts, especially where wear resistance is essential.

While sand-cast SAE 660 has a yield strength of 19,000 psi, the same alloy, continuously cast by ASARCO, has a yield strength of 27,000 psi.

How Continuous-Cast SAE 660 compares with sand-cast 80-10-10 and SAE 62 is shown in the table below:

Alloy	Tensile Strength	Yield Strength	Brinell Hardness
80-10-10 (Sand-cast)	35,000 psi	17,000 psi	62
SAE 62 (Sand-cast)	48,000 psi	20,000 psi	65
ASARCON 773 (SAE 660)	44,000 psi	27,000 psi	72

These extraordinary advantages in physical properties enable engineers to use ASARCON 773 in a variety of applications where more expensive alloys are now being specified . . . even aluminum and manganese bronzes under certain conditions.

ASARCON 773 has other important advantages for the designer to consider:

- It is available in rods, tubes and "extruded shapes" in diameters from ½ inch to 9 inches and in lengths up to 105 inches.
- Rods and tubes are stocked by a national organization of distributors who will cut the size you want to the exact length you need. Expensive short-end scrap is eliminated.
- It is more easily machined than most of the heavy-duty alloys it is used to replace.

ASARCO continuously casts many other bronze foundry alloys. If you want to know more about these unusual metals, call your nearest ASARCON distributor or write directly to us.

ASARCO

Continuous-Cast Products Department

AMERICAN SMELTING AND REFINING COMPANY

Perth Amboy Plant, Barber, New Jersey • Whiting, Indiana
WEST COAST SALES AGENT: Kingwell Bros. Ltd., 457 Minna Street, San Francisco
IN CANADA: Federated Metals Canada, Ltd., Toronto and Montreal

ARTHUR I. HEIM
Research Engineer, Copper & Brass Research Assn., New York

WALTER L. FINLAY
Vice President & Manager of Research Rem-Cru-Titanium Inc., Midland, Pa.

ment work in this field is bringing forth unique composites of metals and inorganic substances.

Important breakthroughs are near in hydrometallurgy and direct reduction for metals. It won't be too long before wrought mill products converted from powdered metal compacts of special purpose alloys are available in quantity.

Mr. Heim . . .

Advances have been made in brass mill extruding techniques. During 1956, one mill succeeded in producing an I-shaped member with a cross section of 7 in., a size which had been thought to be commercially impracticable. Previously, the largest die diameter was 6 in. It had a maximum cross sectional dimension that was considerably less. The development work involved required considerable refinement of extruding methods. New applications for extruded shapes are made possible.

Mr. Finlay . . .

Total shipments of titanium during 1956 (sheets, bars, billets and forgings) were probably over 5000 tons. Twice that amount of business is expected this year, and the indus-

The Smoothies That Make Stainless Steel BEHAVE!

EN-AR-CO Promax CUTTING OILS
H-2 SERIES

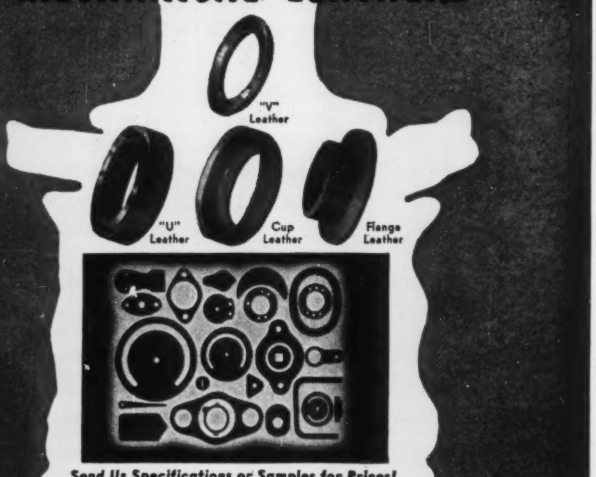
The finest cutting oils obtainable for the machining of stainless steel. The H-2 Series En-ar-co Promax Cutting Oils are specially compounded to overcome the difficulties encountered in machining stainless steel and to assure higher speeds, lower temperatures, longer tool life, better finish, and a sharp decrease in scrap.

A very helpful booklet, "*The Machining of Metals*", is yours on request. Write today.

EN-AR-CO PROMAX CUTTING OILS

NATIONAL REFINING CO., CLEVELAND 1, OHIO

ESTABLISHED 1882



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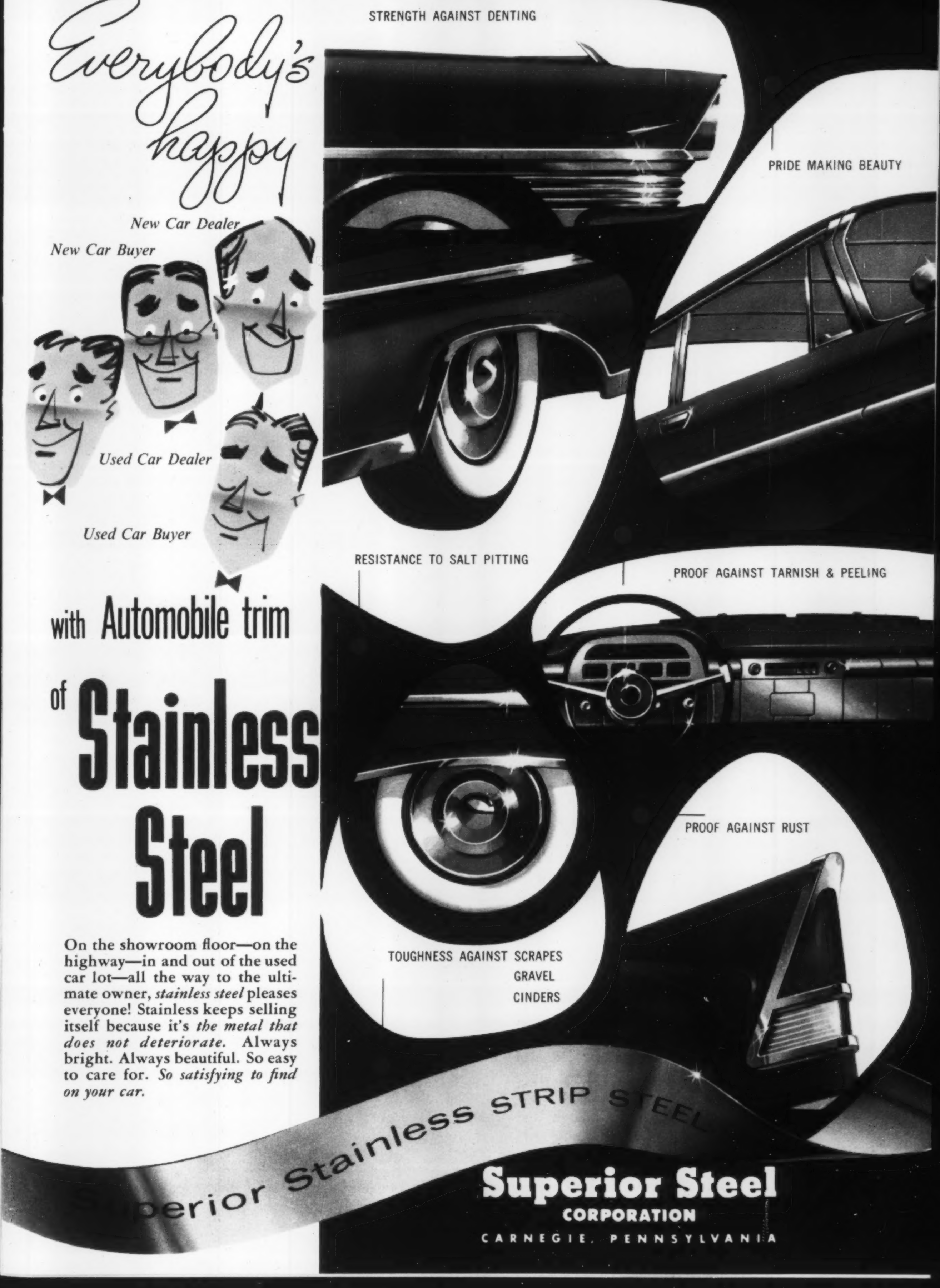
Nothing takes the place of Leather

EXCELSIOR LEATHER WASHER MFG. CO.
ROCKFORD, ILLINOIS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New Car Buyer
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Used Car Buyer
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PROOF AGAINST TARNISH & PEELING
PROOF AGAINST RUST
TOUGHNESS AGAINST SCRAPES
GRAVEL
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Superior Stainless STRIP STEEL

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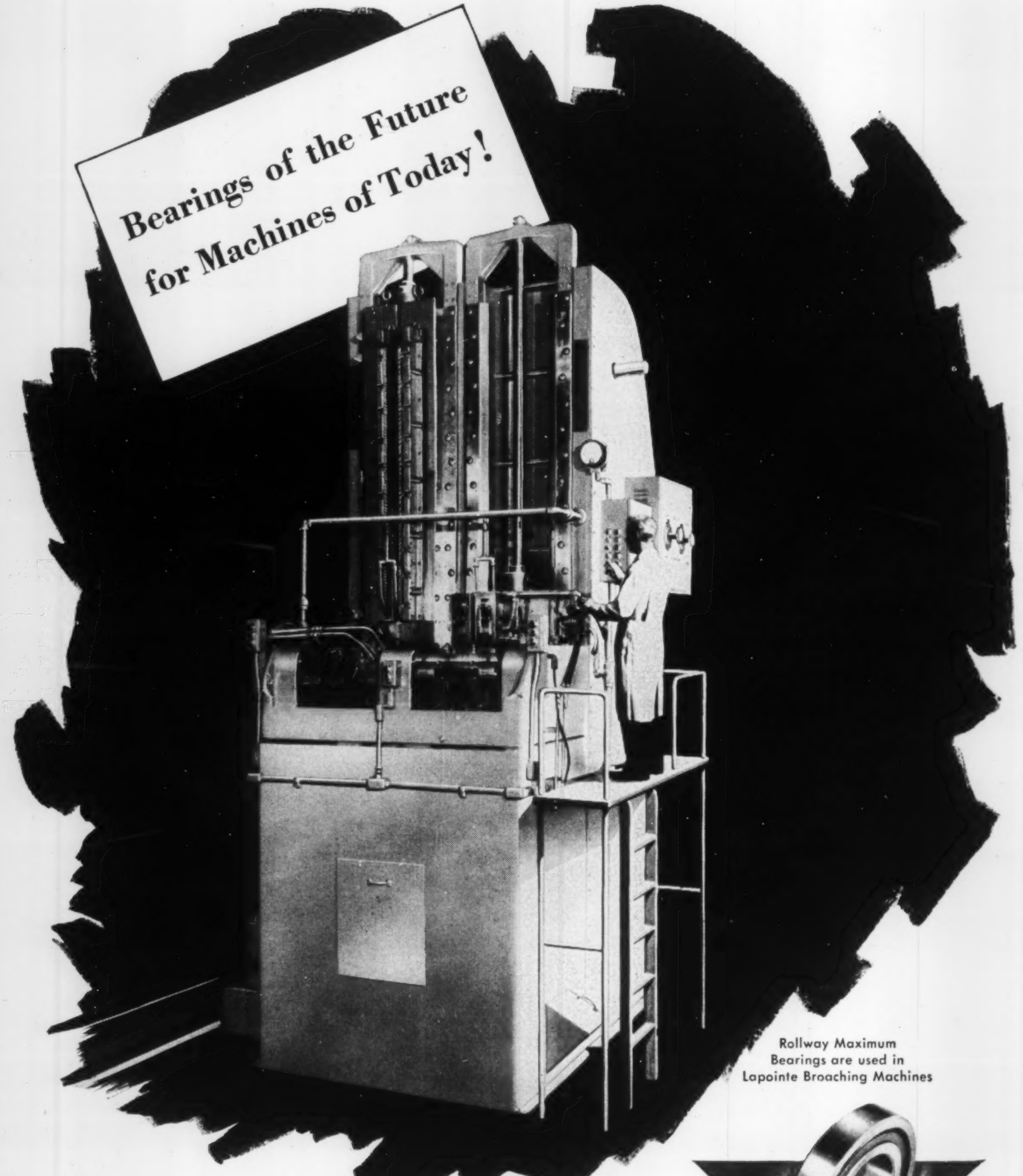
with Automobile trim of Stainless Steel

On the showroom floor—on the highway—in and out of the used car lot—all the way to the ultimate owner, *stainless steel* pleases everyone! Stainless keeps selling itself because it's *the metal that does not deteriorate.* Always bright. Always beautiful. So easy to care for. *So satisfying to find on your car.*

Superior Steel
CORPORATION
CARNEGIE, PENNSYLVANIA



Rollway Maximum
Bearings are used in
Lapointe Broaching Machines

Rollway roller bearings regularly offer performance capabilities for more than the needs of today. They are continuously anticipating the operating requirements of years ahead.

Wherever bearing precision and load values are important in your plant or products — for original equipment or replacement service — call on Rollway *bearings of the future,* to give you the utmost performance in your machines of today. Rollway Bearing Company, Inc., Syracuse 4, N. Y. Manufacturers of a complete line of radial and thrust cylindrical roller bearings.

ROLLWAY
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ROLLER BEARINGS

ENGINEERING OFFICES: Syracuse • Boston • Chicago • Detroit • Toronto • Pittsburgh • Cleveland • Milwaukee • Seattle • Houston • Philadelphia • Los Angeles • San Francisco

A. J. LANGHAMMER
Chairman, AOA Powder Metallurgy Committee, Chrysler Corp., Detroit

try is rapidly expanding to meet the demand.

Pratt & Whitney's famous J-57 jet engine uses large quantities of titanium as a replacement for steel. The Boeing 707 and the forthcoming Douglas DC 8, America's first jet passenger transports, will be powered by the JT-3 and JT-4, which are commercial developments of this engine type. Most military planes have significant quantities of titanium and titanium alloys in their frames.

A healthy peacetime market is also developing. It's based on titanium's excellent chemical and environmental corrosion resistance. In many cases, it is the most economical material of construction on the basis of replacement costs alone.

Mr. Langhammer . . .

Continued expansion will be seen in all branches of powder metallurgy. Presses with multiple actions, greater capacity (in terms of size, tonnage and output) and improved atmospheres and controls will be the established practice. Attractively priced powders with improved quality and covering a broader range of metals and alloys will continue to appear in quantity.

Practically every known industry is using metal powder products, including our armed forces. Some automobiles contain approximately 100 separate units.

Mr. Bechtold . . .

The number of new alloys coming from the research and development laboratories of the country should be greater in 1957 than in any pre-

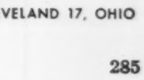
what's so special about precision?

To this little fellow building the 1956 "dream car", precision is a bent nail or a split board. To modern automotive engines and aircraft power plants, PRECISION is a most important element. That is why CHANDLER specialists are working harder than ever to supply cap screws to closer tolerances to meet your new requirements. Chandler is producing the finest fasteners today in all of its 25 years of experience. Chandler is specializing in mass production of bolts from high alloy steels . . . with special heads or threads . . . with drilled heads or shanks . . . ground to close tolerances . . . and with threads rolled after heat treating.

There is a Chandler cold wrought fastener to meet your specifications. And remember, at Chandler . . . there is nothing special about PRECISION because we do it every day.

6862-CH

Write today for Bulletin 1264-CH



CHANDLER
PRODUCTS CORPORATION
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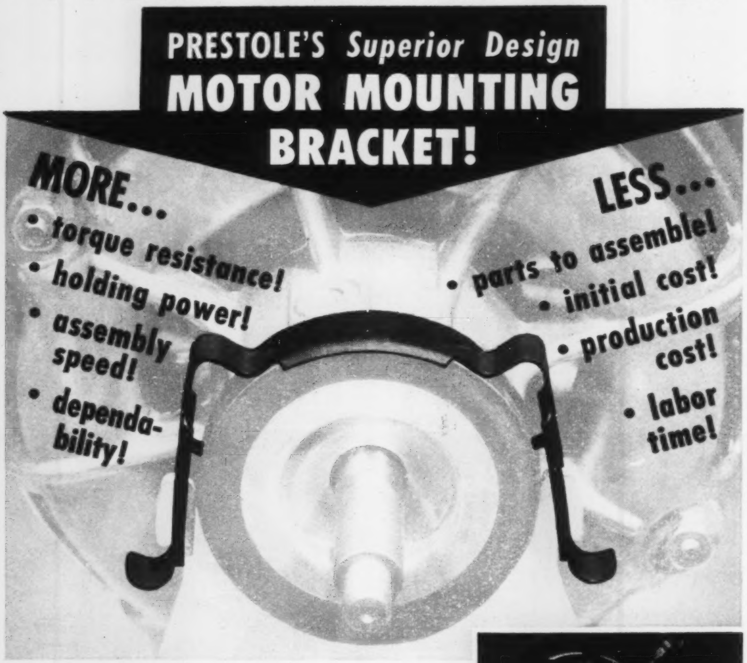
4-POINT HOLDING POWER



Among the numerous advantages of this new Prestole product are its greater holding power, simplicity of design, ease and speed of assembly, and low initial cost. *It eliminates three parts* formerly used in mounting motors. Where the holding power formerly depended on the variable tightness of a screw, Prestole's Motor Mounting Bracket, with exclusive 4-point grip on the motor mounting ring, maintains the same, constant holding power indefinitely.

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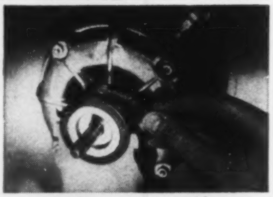
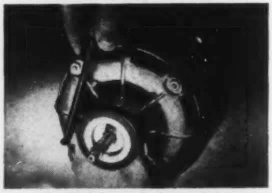

1. One-part assembly.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J. H. BECHTOLD
Manager, Metallurgy Dept., Research Laboratories, Westinghouse Electric Corp., Pittsburgh

G. L. BACHNER
General Manager, Powdered Metal Products Div., Yale & Towne Mfg. Co. Franklin Park, Ill.

vious year. Major advances should come in high temperature and magnetic alloys.

In fundamental research, this year should see major advances toward an understanding of the distribution of solute atoms in metallic solid solutions and the effects of the solute distribution on properties. Significant contributions can also be expected in the theory of liquids and solidification.

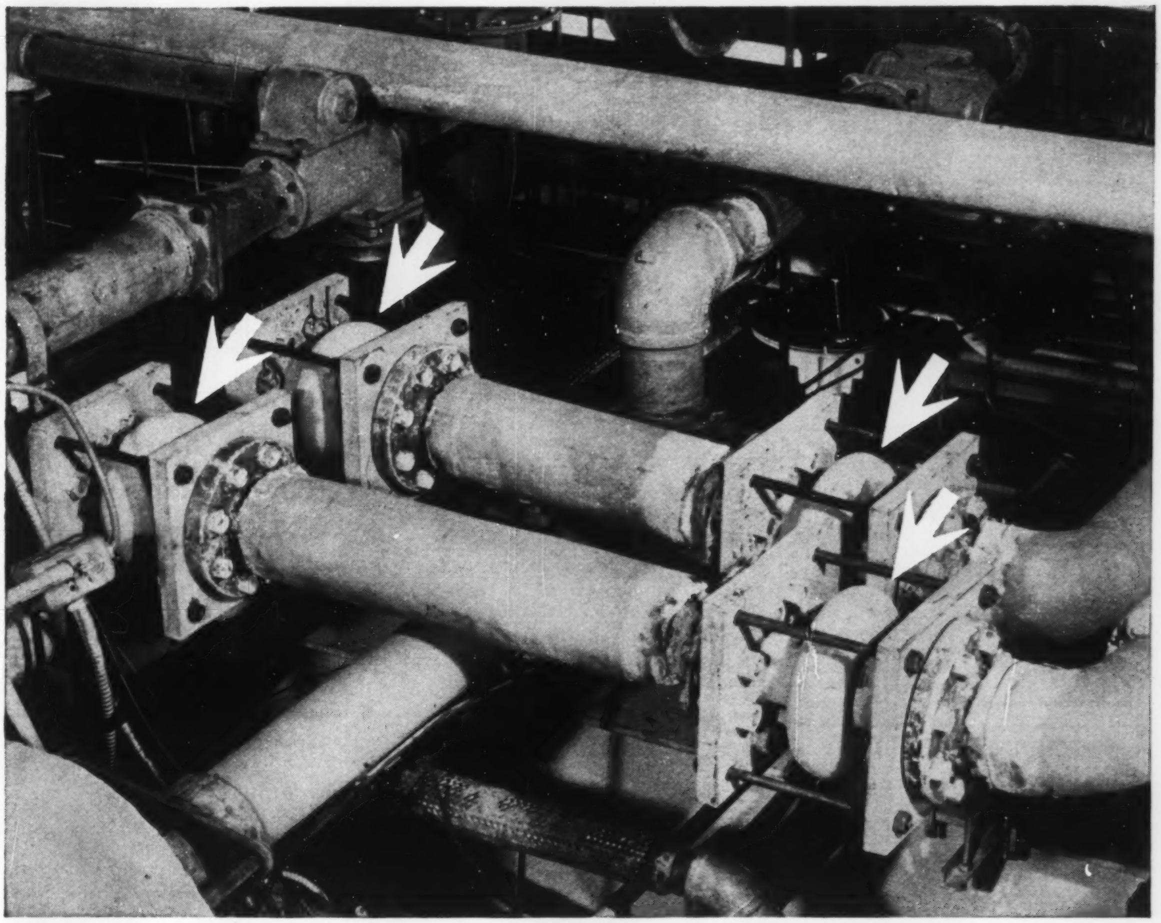
Increased activity on recrystallization and grain boundary mobility should result in a better understanding of the factors controlling preferred orientation. These advances will accelerate development of improved materials.

Mr. Bachner . . .

In 1957, we should benefit from our institutional education program on powdered metal products. One of the most important facts is the development of a new kind of engineer—the powder metallurgist.

They specialize in the new field of mechanical metallurgy. Their realistic approach to manufacturing and application problems is accelerating the growth of powder metal products.

New equipment is being developed to manufacture metal powder parts.



"Only *Carpenter* Stainless Tubing gives us failure-proof service"

The manufacturer of these four truly maintenance-free packless expansion joints (shown by arrows, above) has tried other stainless tubing, but says Carpenter Stainless Tubing is the "only one that renders failure-proof service".

These joints absorb thermal expansion, operating at pressures up to 210 psi and temperatures up to 650°F. They are typical of expansion joints made from Carpenter Tubing which operate at pressures up to 10,000 psi or temperatures as high as 1800°F. Once installed, they have never been replaced. Some have been in service over 15 years. The quality and uniformity of Carpenter Stainless Tubing contributed greatly to the trouble-free fabrication and maintenance-free service of these joints.

If an extra measure of quality in stainless tubing and pipe can improve your products or operation, call your Carpenter Distributor. He's your nearby source of better stainless tubing and pipe.

MEMBER **The Carpenter Steel Company,**
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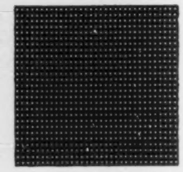
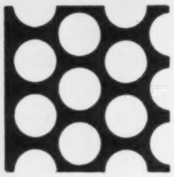
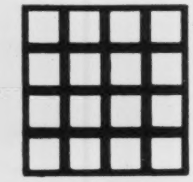


A MEDIUM OF LIMITLESS APPLICATIONS

Designers are discovering an ever-increasing range of applications for perforated materials. For functional or decorative purposes, or where a combination of both is essential, H & K perforated materials are used in more products, in more accessories, in more places than ever before.





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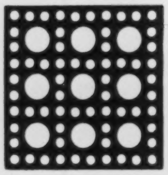
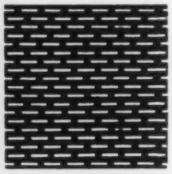
Design, pattern and open area for almost every application may be selected from our thousands of perforating dies—at no charge for tooling. (Tools for special designs can be built to order.)





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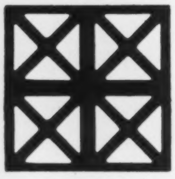

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National Alloy Div., Blaw-Knox Co.
Pittsburgh

It includes multiple ram, automatic proportioning presses, precisely controlled special purpose atmosphere generators and sintering furnaces. This equipment enhances the powder metallurgist's contribution to industry and opens up new fields of application.

Mr. Ornitz . . .

Increased furnace efficiencies, through the use of higher temperatures, have resulted in increased demands for high temperature alloys such as NA-22H. Laboratory development and research in progress hold promise for stronger high temperature alloys.

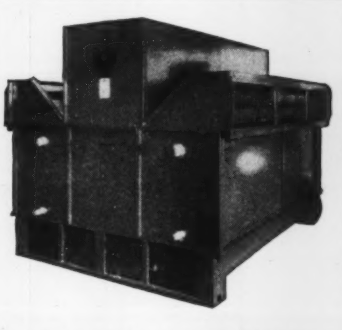
The needs of the aircraft industry for stainless castings which withstand high temperatures have raised new problems. Techniques will have to be developed to produce much thinner wall sections than are now available.

New problems are being created in the atomic energy field where delivery and costs on forged or seamless stainless materials may well necessitate a shift to centrifugal castings, once techniques can be developed to satisfy the rigid requirements.

Mr. Jones . . .

Outlook for the vacuum melting industry, at the stage of "getting down to brass tacks," is particularly bright.

Because of the increase in capacity, those in the industry have a clearer idea of what can be done with the technique. This knowledge will be particularly valuable in the coming



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WHEATLAND-57

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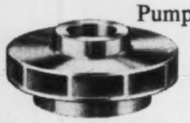

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The flat head capacity characteristic of the Radial-Flow impeller is applied to systems such as fueling, condensate return, and cooling towers, which operate at constant pressure against varying capacities and under throttled conditions.

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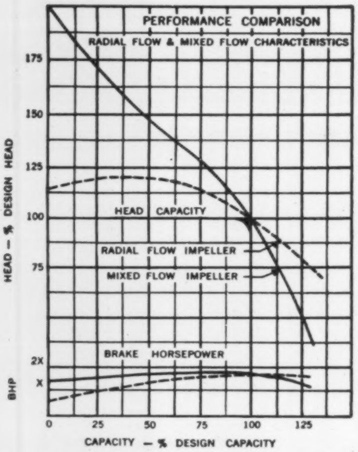
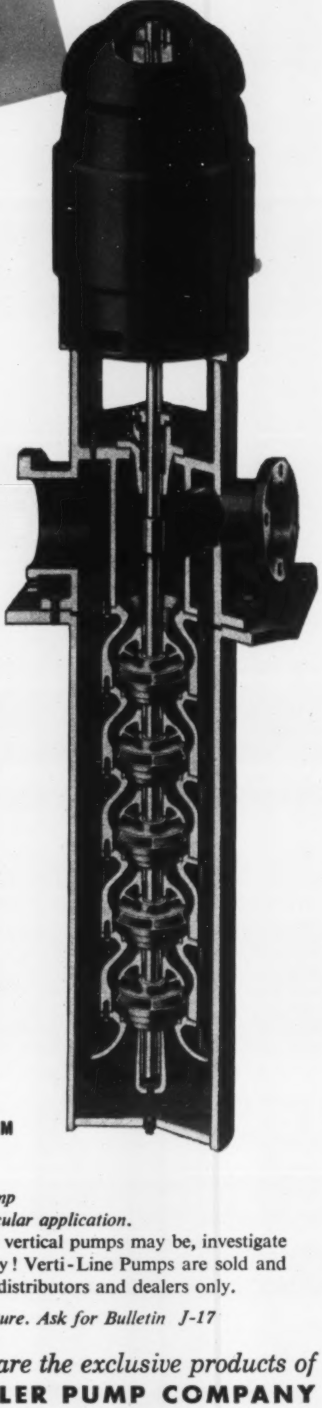
The steep head-capacity characteristic of the Mixed-Flow impeller is applied where constant capacity is required at fluctuating pressures such as pipeline pumps or units operating in parallel or series.





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W. E. JONES
Manager, Vacuum Melted Products
Metallurgical Products Dept., General Electric Co., Detroit

BRUCE E. BRENNAN
Supervisor, Engineering Data
Reynolds Metals Co., Louisville

year, when the demand for vacuum melted special alloys will double. Most of the products will be high temperature alloys for aircraft.

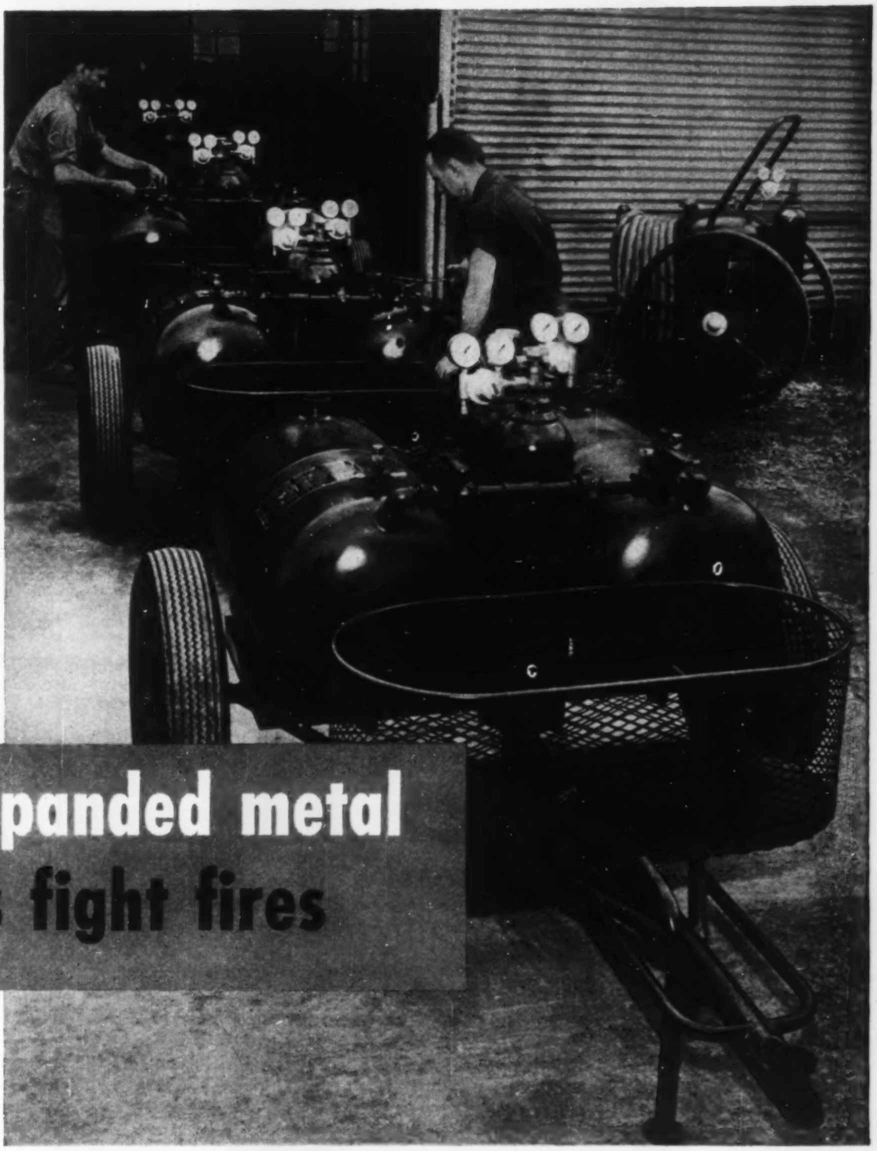
This year should also see a better evaluation of vacuum induction and vacuum arc melting methods to clarify their advantages.

Mr. Brennan . . .

Aluminum has many functional advantages to offer the auto designer. It's certainly not the lowest cost material, if consideration is given only to its base price per pound. But the finished cost of an aluminum part must be cheaper than that of a cast iron or sheet steel part if it is to be used in preference to competing materials.

This is possible by designing to aluminum's properties and casting, forming and finishing by the methods that make maximum use of its characteristics.

Aluminum auto body panels might appear to be so costly that they could never supplant steel. But a panel that incorporates all trim details in a single stamping would have important economies. Anodized aluminum panels can be masked where the natural color is desired, then dyed in many attractive and permanent colors in the unmasked areas.



McFarland Fire Wagons, distributed by the Unox Co., Houston, Texas. Hose basket is formed from Penmetal expanded metal.

How expanded metal helps fight fires

Feature of the McFarland line of Wetter Water Fire Wagons is a basket mounted at the front of each unit – keeps the hose in a handy, compact coil.

The design of these hose baskets is interesting because it represents a neat solution to a construction problem. They had to be *strong* enough to take the weight and use-abuse of many feet of high pressure hose . . . *light* enough to keep within portability requirements. Other factors were appearance and cost.

McFarland Manufacturing Co. found the perfect answer to all their requirements in Penmetal expanded metal. This versatile material is sheet metal slit and expanded to as much as ten times original width. 80% lighter than solid sheet, the diamond truss pattern adds rigidity and strength. It's easily formed, shaped and welded . . . and, is low in cost.

The wide range of valuable properties available in expanded metal has made it the ideal material for many, many jobs. Examples: Fan enclosure; portable heater guard; parts basket for industrial cleaner; T.V. base; radar antenna.

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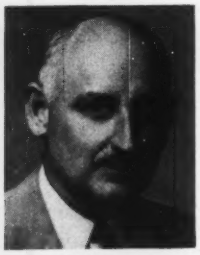

E. W. CUNNINGHAM
Manager, Industrial Heating Dept.
General Electric Co.
Shelbyville, Ind.

C. L. IPSEN
Executive Vice President, Industrial
Heating Equipment Assn. Inc.
Washington

HEAT TREATING

FORUM ON TECHNICAL PROGRESS

More in-line processing enters the picture . . . automatic atmosphere controls eliminate problems . . . rapid strides being made in vacuum treatment . . . more emphasis on quality control . . . furnace will be more compact . . .

Mr. Holcroft . . .

Furnaces this year will emphasize the use of methods and materials which will increase quality control and lower cost. Design ideas, perfected through job experience over the years, will come into wider use.

For example, a new alligator-type outer door will be used on continuous controlled atmosphere furnaces. It has the safety feature of opening automatically in case of power failure. Its positive tightness will exclude air from the furnace vestibule.

Refractories and ceramics will take even bigger steps this year in replacing hard-to-get nickel-chromium alloys, particularly in skid rail applications. Furnaces will be more compact to save floor space. Operation will be safer with the use of mechanical apparatus designed to eliminate the danger of hydraulic oil fires.

Mr. Stevenson . . .

The trend to automation in heat treating continues.

Dependable automatic atmosphere control eliminates a problem: The requirement for constant attendance at a furnace. Heating elements which work in highly carbonaceous atmospheres bring electric furnaces back into these applications. Electric heating makes for simplicity, which is important when supervision is to be reduced.

Last year saw a furnace chamber heated by 60 cycle induction for the first time. The heating system of this furnace has the simplicity and dependability of a transformer. Furnace bodies can be in motion without worrying about gas or power connections and problems of flexible or sliding contacts.

This trend toward induction heating of furnaces (as differentiated from induction heating of parts) will grow as new types of furnaces are developed to take advantage of its many possibilities.

Mr. Cunningham . . .

Progress is being made in the development of continuous automatic operations, the most important trend in heat treating.

Another important trend is toward higher operating temperatures—2200 to 2600°F, for applications such as brazing alloy steels. Production furnaces, suitable for either protective atmospheres or vacuum, are being installed for this use.

Vacuum heat treating is expanding rapidly. Furnaces are now of the batch type, but industry will soon insist on continuous equipment.

We think the heat treating industry will require more automatic equipment with faster heating rates, higher temperatures and more precise controls. It will be controlled by a tape or cards, so that heating cycles can easily be changed by inserting a different card or typing a different instruction on the tape.

Mr. Ipsen . . .

Technological advances in equipment and increased plant expansion combined to make last year another record one for the industrial heating equipment business.

Orders for industrial furnaces in 1956 were 20 per cent higher than they were in the previous record year of 1955. Members of the Industrial Heating Equipment Association forecast that business in 1957 will maintain the 1956 level.

A comparison of orders secured by IHEA members during three post World War II years with those during three corresponding post Korean War years shows a 265 per cent increase in industrial heating business. During the same period, gross national product increased about 60 per cent. Here are some of the reasons why the industrial heating industry has outstripped

HENRY M. HEYN
Vice President & General Manager
Industrial Div., Surface Combustion
Corp., Toledo, O.

H. E. BOYER
Chief Metallurgist, American Bosch
Div. American Bosch Arma Corp.
Springfield, Mass.

L. R. HAGUE
Manager, Industrial Heating Div.
Westinghouse Electric Corp.
Meadville, Pa.

H. B. OSBORN JR.
Technical Director, Tocco Div.
Ohio Crankshaft Co., Cleveland

the general economy by more than 4 to 1: 1. Mechanization, increased instrumentation for automatic quality control, atmosphere generating equipment and improved safety devices have greatly increased the unit price of each new installation—an increase fully justified by reduced operating costs and improved quality of heat treated products. These technological improvements have greatly accelerated the replacement of obsolescent equipment. 2. Increased performance standards require heat treatment of parts not formerly heat treated. 3. New metals require special equipment, such as vacuum, for melting and heat treatment.

Mr. Heyn . . .

The trend is toward quality control through complete processing, with one of the major contributions being automation of equipment. This means heat treatment under conditions where every step is handled by predetermined methods under a schedule of production which insures uniformity.

Fully automatic batch type furnaces, which include automatic carbon control equipment, are in production. Today, the batch type furnace, with atmosphere control, can be used for carburizing, dry cyaniding, carbon restoration and homogeneous carburizing. By having an integral quench, the work can be quenched without being exposed to the atmosphere.

Considerable progress is being made in the application of controlled atmospheres. Not only are the carbon bearing gases being used, but the future will see combinations of atmospheres, such as dissociated ammonia, hydrogen, nitrogen and carbon bearing gases, all utilized to do a particular job of heating and treating complex steels.

In gas carburizing, greatest technical progress has been made using dew point controllers to fully utilize the carburizing potential of the furnace atmospheres.

Mr. Boyer . . .

Whether the central heat treating department can be entirely eliminated is still open to question—at least for factories which are widely diversified. Even though complete in-line processing may not appear on the immediate horizon, progress is being made toward doing heat treating in the required manufacturing sequence without the added cost of loading and hauling.

This trend brings a different concept in heat treating methods and equipment: First, the product designers must consider the new manufacturing technique. Second, the manufacturing layout must be well planned. Last, but not least, the builders of heat treating equipment must depart farther from the conventional. It is predicted that within the next few years central heat treating departments will be virtually discarded in favor of in-line methods.

Mr. Hague . . .

Progress in vacuum metallurgy has been tremendous. But it has been chiefly instigated by a handful of producers of forging and specialized steels, and defense industries which were demanding metals with vastly improved properties. Vacuum melting and heat treating techniques fulfilled this need.

While the market potential for vacuum produced alloys and the required vacuum equipment is unlimited, the market today is still relatively small and the equipment costly. So long as a vacuum alloy is processed for a single end use, the cost of the metal and the new furnaces will remain high.

Engineering and structural designers are the only ones who can bring about demand and break the price stalemate. They must break their ties with traditional materials and critically examine the properties of the vacuum alloys. They can improve their products and open the way for even greater advances in vacuum metallurgy.

Mr. Osborn . . .

There is an increasing tendency to recognize induction heating equipment as a machine tool. It's only reasonable, then, to see many aspects of automation in its design and operation.

Precise heat treating, from the metallurgical standpoint as well as dimensional control, is of vital importance to a product. At high production rates, we cannot depend on the skill of an operator. Automatic transfer devices, hopper feeds and automatic unloaders are becoming commonplace in induction heating machinery.

Even in the forging field where one may assume that the heating requirements are not necessarily critical, the equipment is automated with hopper feeds which automatically provides billets to a mechanism which

big industry, small world

annealing covers
billet reheating furnaces, continuous
carbon restoration and annealing furnaces, continuous
controlled atmosphere generators
high-speed stress relieving furnaces
one-way fired soaking pits
pit-type annealing furnaces
slab and billet heaters, continuous
strip annealing furnaces, continuous
strip galvanizing lines, continuous
wire patenting furnaces, continuous

Wherever this steel goes—from first soak to final shipping dock—it will find that the big steel industry is a small world as far as 'Surface' equipment is concerned. Somewhere along the line, whatever its destined shape, the steel will be made more workable and more useful in 'Surface' furnaces.

Why is it so easy to bump into 'Surface' in steel mills? One reason is that 'Surface' has literally grown up with the steel industry. A better reason is the confidence that steelmakers have in the performance of furnaces and generators manufactured by Surface Combustion Corp., Toledo 1, Ohio.

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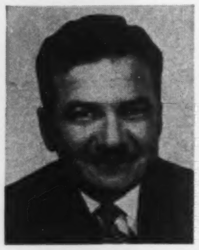


H. N. BOSWORTH
President, Metal Treating Institute
Bosworth Steel Treating Co.
Detroit

F. O. HESS
President, Selas Corp. of America
Dresher, Pa.

J. A. LOGAN
President, Magnethermic Corp.
Youngstown

HORACE DREVER
President, Drever Co.
Bethayres, Pa.

D. E. MOAT
Director of Marketing
Leeds & Northrup Co., Philadelphia

passes the parts through a coil from where they are delivered to the operator for forging. A recent innovation is the use of detachable hoppers which are filled automatically at a cutoff machine, which is remote from the induction equipment, and reloaded on the heating mechanism as they are needed.

Mr. Bosworth . . .

The commercial heat treating industry is expanding at a startling rate—both in number of dollars being invested in equipment and in dollar volume of sales. Last year, business was from 25 to 42 per cent above 1955's depending upon the locality.

Huge furnaces of unique design are being installed in commercial heat treating plants. They handle the larger, more complex fabrications of stainless and heat resisting alloys being turned out in the atomic, jet and guided missile fields. These new furnaces, though complex in design, are highly versatile in heating temperatures, varieties of atmospheres and the use of various cooling rates.

Mr. Hess . . .

Automatic equipment for heating and heat treatment is gradually being absorbed into the production line.

To meet the requirements of automatic processing, standard furnace equipment is no longer adequate. It's steadily giving ground to custom built equipment, which is designed to accommodate the workpiece. Giving each piece individual attention—rather than considering it as part of a batch—improves uniformity.

High speed heating equipment alone is not enough; versatility to handle varying production rates is necessary. To meet the responsibilities of automation, the furnace builder must become a material handling, as well as a heat transfer specialist.

Mr. Logan . . .

Our electrical engineers were spending hours solving the complicated equations used in the design of our induction coils. Since much of the work was repetitious, this seemed like a needless waste of scarce talent.

The solution was to automate the engineering: Set up the equations, set practical limits, then solve them with an electronic magnetic drum computer. It took 100 man-hours to set up the work on the computer, and less than 5 hours for the machine to solve over 180,000 equations for three common metals—aluminum, copper and brass.

With these results, the 3 hours an engineer used to spend on each induction coil boils down to the 15 minutes needed to arrange computer answers in usable form. And there's no chance for error.

We must use our technical talent to the greatest advantage. Computers can save hundreds of man-hours of engineering time and release the engineer to do work that requires his full talent. You need not own a computer, or have one under lease. It is available for short-term lease to a small business, so it can jump right in and make the most out of this new tool.

Mr. Drever . . .

There have been surprising results in the application of vacuum treatment to such difficult operations as bright tempering of hardened stainless steels and the annealing of various types of electrical steel—including such common materials as Armco iron.

We have found that vacuum can sometimes be substituted for hydrogen atmospheres to advantage. Bright charges, in particular, are handled more economically than they are with atmospheres of hydrogen or dissociated ammonia. Other materials that are benefited by vacuum heat treatment are Elinvar, Cobenium, Nispan and titanium. Vacuum furnaces are also used to remove hydrogen absorbed by titanium during processing of the sponge.

Mr. Moat . . .

The control of carbon concentration in the carburizing process grows in importance. The reason: Carbon, more than any other element, affects the physical properties of a part. Many premature failures of highly stressed parts made of high alloy, carburizing grades of steel can be traced to a lack of proper carbon control during carburizing.

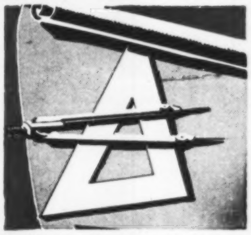
Steam is another atmosphere which is being widely used in furnaces. It's cheap and highly effective in low temperature operations such as stress relieving and tempering.

The microthin oxide film produced on ferrous parts by steam treating improves tool life, offers excellent

6 reasons for checking your Commercial Heat Treater First

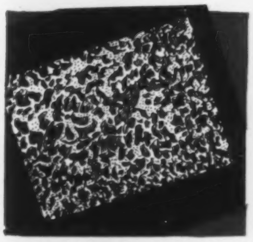
HE PROVIDES . . .

1



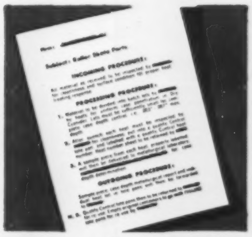
Guidance in Steel Selection and Design

2



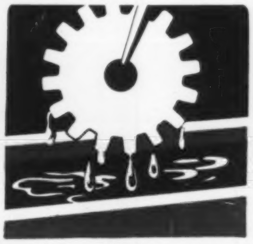
Metallurgical Understanding of Metal Properties

3



Assistance in Proper Preparation of Parts for Heat Treating

4



Knowledge through Experience of the Right Heat Treat for the Job

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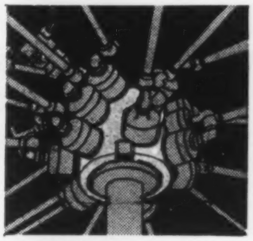
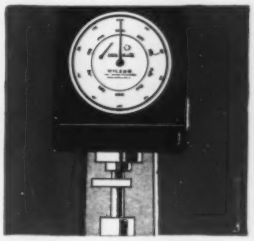


Extensive array of Equipment and Facilities

6



Final laboratory and non-destructive Testing

Whenever your production requirements for a new product or the redesign or improvement of an old one mean the installation or expansion of heat treating activities, it will pay you to check with your Commercial heat treater before tackling the job yourself.

The 6 basic reasons for this are shown above.
Remember the Commercial Heat Treater has the skill, the experience,
the equipment;—all under one roof ready to serve you.

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Brazing aircraft wing assemblies in Hydrogen atmosphere, Holcroft furnace. Gas-tightness essential. Max. temp. 2150° F.

Elliptical form with single longitudinal weld. 6" wide, 2½" high x 17 feet. AGF furnace, annealing steel strip.

2700-lb. muffle, corrugated, welded fully annealed after fabrication. Rockwell furnace, continuous annealing at 1600° F.

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Chief Metallurgist, Warner Gear Div
Borg-Warner Corp., Muncie, Ind

IRVING A. DICKTER
Chief Metallurgist, Process Machinery Div., Cincinnati Milling Machine Co
Cincinnati

resistance to corrosion and provides an attractive appearance. Brass, bronze, aluminum and beryllium copper parts can be stress relieved in a steam atmosphere with only slight discoloration.

Mr. Peters . . .

Developments in heat treating are following the lines of more highly qualified control. Much new equipment is available which will harden, quench, draw and clean in a continuous line. Specialized equipment, heated by induction, hardens parts free from scale. It is compact and efficient in power consumption and floor space.

The increased demands of industry for higher performance and greater economy will require closer co-ordination of design, materials and production methods. All factors associated with quality will be subject to close analysis.

Mr. Dickter . . .

Emphasis on automation last year is reflected in the variety of flame hardening equipment we supplied with special tooling. Dual spindle machines are producing a high rate of production with minimum operator effort. Machines with single or

Uniformity...

dip-joint construction speeded with accurately sized Armstrong Brick

All seven types of Armstrong Insulating Fire Brick are made slightly oversize and then machined down to specific dimensions with a maximum allowable tolerance of 1/32". This permits fast, accurate wall construction with dipped or thin trowelled mortar joints. Even if the brick are laid up dry, uniformity of size assures heat-tight joints.

Send for free booklet giving complete information on the entire line of Armstrong Insulating Refractories. Write Armstrong Cork Company, 2701 Reed Avenue, Lancaster, Pa. For expert help the next time you have a refractory problem, call in your Armstrong engineer.

Armstrong INSULATING REFRACTORIES

Armstrong A-20
Armstrong A-30

HEVI-DUTY SALT BATH FURNACES

WITH IMMERSED ELECTRODES

Temperatures
from
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2400° F.

Built to any size or capacity with either a ceramic, welded steel, or alloy pot whichever the particular process requires.

SPECIAL FEATURES
of the HEVI-DUTY FURNACES

- Immersed alloy electrodes with water-cooled terminals which prevents the conduction of heat to the transformer.
- Self-contained ceramic pot quickly removable. Ceramic, steel, or alloy pots are interchangeable—thus one furnace can be used for a variety of operations by merely changing to the pot best suited for the process.
- Electric starting coil quickly remelts the salt after a shut-down.
- Recessed electrodes permit a rolling cover, thus minimizing heat radiation from the bath surface.
- Low operating voltage eliminates shock danger.

Send for Bulletin 655. It describes the other advantages of Hevi-Duty Salt Bath Furnaces.

HEVI-DUTY ELECTRIC COMPANY
MILWAUKEE 1, WISCONSIN
Heat Treating Furnaces . . . Electric Exclusively
Dry Type Transformers *Constant Current Regulators*

W. A. DARRAH
President, Continental Industrial Engineers Inc., Chicago

J. L. WHITTEN
Vice President, Lee Wilson Engineering Co. Inc., Cleveland

multiple stations can produce parts at the rate of thousands per hour, depending on the surface to be heated and the size of the parts.

Machines with special tooling for flame hardening heavier parts are receiving a great deal of attention.

Mr. Darrah . . .

Automation makes split second timing of transfers and quenches possible. A new range of time limits in the quench pays large dividends in improved grain structure and improved physical characteristics. This trend promises to progress.

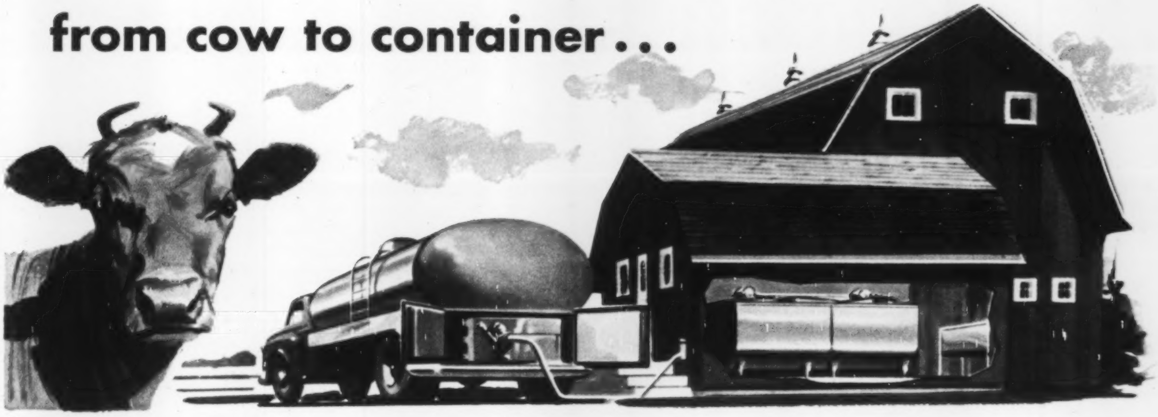
One of the old headaches of heat treating—warping—is yielding to automation and controls. By replacing manual handling with machines, using careful positioning and timing, warping is reduced or eliminated.

Mr. Whitten . . .

Last year saw further acceptance of the single stack furnace for annealing. With the realization that this furnace gives every charge special treatment, users have expanded pilot installations of several units to as many as 24 furnaces. Larger installations are under consideration.

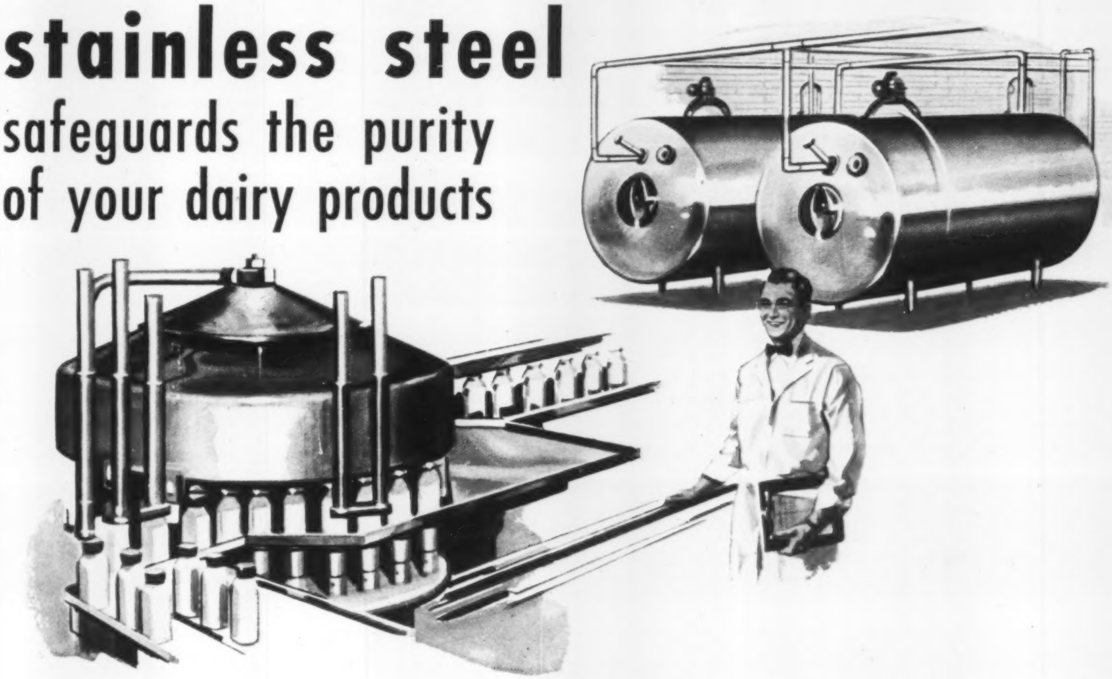
High convection annealing for rod

from cow to container...



stainless steel

safeguards the purity of your dairy products



Dairymen and milk-product plant operators know that Stainless Steel is the only metal that year after year effectively resists acid corrosion. It can easily be kept clean and sterile and imparts no odor in contact with the product.

Through all the stages of milking, transportation, processing and packaging Stainless Steel completely safeguards the delicate flavor and highly sensitive qualities of milk and cream, and milk products like butter, cheese, ice cream and powdered milk.

The delicious taste of your dairy products and the assurance of their purity is due to the dairyman's extreme care and scientific methods and the use of Stainless Steel equipment.

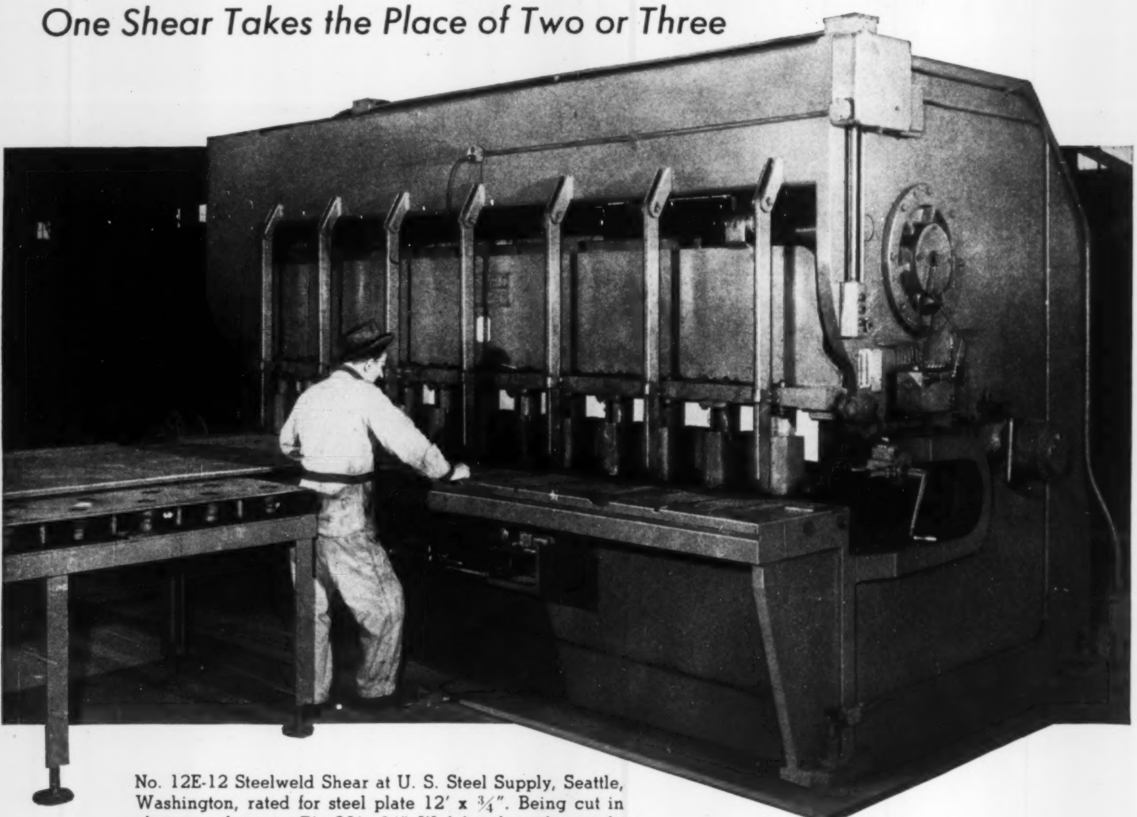
McLOUTH STAINLESS STEEL

For the product you make today and the product you plan for tomorrow specify McLouth high quality sheet and strip Stainless Steel

McLOUTH STEEL CORPORATION DETROIT, MICHIGAN • MANUFACTURERS OF STAINLESS AND CARBON STEELS

U. S. Steel Supply Provides Customers with SMOOTH ACCURATE SHEARING

One Shear Takes the Place of Two or Three



No. 12E-12 Steelweld Shear at U. S. Steel Supply, Seattle, Washington, rated for steel plate 12′ x ¾″. Being cut in photo is a plate, size 7′ x 30′ x ¾″. With hand crank on right end, this machine can be adjusted in a few seconds to have exactly the right knife clearance to obtain the finest cut for any thickness. To make this adjustment on guillotine-type shears usually requires several hours.

MANY steel warehouses have two and often three shears, one of a ¼″ capacity for lighter thicknesses, another of ½″ capacity for cutting ¼″ to ½″ material, and a third with 1″ capacity for thicknesses over ½″ and up to 1″. At some of its warehouses, U. S. Steel Supply uses only one machine for cutting the various thicknesses—a Steelweld Pivoted-Blade Shear.

One machine takes the place of two or three, because it is so easy to adjust the knife clearance required to obtain the best cuts for different thicknesses, which can range from lightest gauge metal to the heaviest plate within the capacity of the shear.

Thus, the investment in shearing equipment is kept low, yet the customers of U. S. Steel Supply are always assured of straight, smooth, accurately cut metal on every order.

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CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

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7853 East 282nd Street, Wickliffe, Ohio

STEELWELD PIVOTED BLADE SHEARS

E. E. STAPLES
Executive Vice President
Hevi Duty Electric Co., Milwaukee

and wire coils had a broad acceptance in 1956, particularly for the larger units that could be loaded with three stems of rod coils in one charge. The first units of this design were built several years ago for charge diameters of 108 in., but the increase in diameter of rod bundles pushed this to 114 in. One new installation for spheroidizing rod coils calls for piling heights of 108 in.—something entirely new in the wire industry.

Mr. Staples . . .

More automation will be applied to heat treating processes by placing furnaces in the production line and in feeding equipment. Mechanized salt bath furnaces which pass the work through heating, quenching, tempering and washing steps will be more common.

The heat treatment of titanium and zirconium is becoming more stabilized. The operation of atomic power plants for generating electricity and driving ships will establish the importance of beryllium, zirconium and hafnium. To meet processing demands for these metals will require continuing study by the industrial heating equipment industry. Guided missiles and higher speed aircraft continue to demand better, higher temperature furnaces.

In Europe, the rush to increase steel production and improve processing is pushing application of the newest heat treating equipment.

Mr. Osterman . . .

Quality control is increasing in importance as manufacturers of small parts must meet demands for better metallurgical characteristics.

The answer is in the use of con-

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PARTS LAST LONGER... if they're centrifugally cast by the Shenango process. Tougher parts because of finer, pressure-dense grain, greater strength, better elongation and freedom from sand inclusions and blow holes. There's minimum waste, less machining. The large bronze liner and seat ring shown here are typical of various parts, large and small, ferrous and non-ferrous, regularly produced in Shenango's modern plant. Informative bulletins give all the facts. Write to: Centrifugally Cast Products Division, The Shenango Furnace Company, Dover, Ohio.

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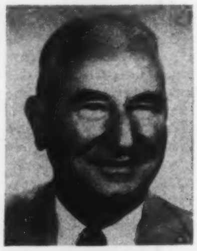


P. C. OSTERMAN
President, American Gas Furnace Co.
Elizabeth, N. J.

L. B. ROSSEAU
Vice President & General Manager
Ajax Electric Co., Philadelphia

tinuous, automatic installations—reciprocating or shaker hearth furnaces, rotary retort furnaces and mesh belt conveyor furnaces equipped with automatic feeding devices, quenching tanks, washing machines and tempering equipment.

Continuous automatic furnace installations permit decentralization of heat treatment. The operation is being moved from the heat treating department and is being incorporated into the small parts production or assembly line.

Mr. Rosseau . . .

Our latest salt bath development is a removable, submerged electrode design. Electrode replacement is simple: Lift a tile that lies over each pair; remove the worn-out electrodes; install new ones; and replace the tile. The pot does not have to be torn down or rebuilt.

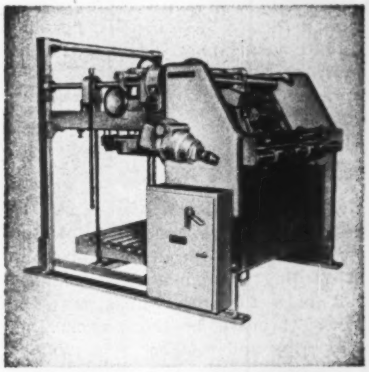
Salt baths are being used increasingly to heat treat zirconium and uranium for the atomic energy program. A 300-kw salt bath furnace was recently installed for heating stainless steel turbine blades in drop forging. The operation has been so successful a duplicate furnace is being installed. We have just sold a salt bath furnace for use as part of a heat exchange setup.

DEXTER
AUTOMATIC
METAL SHEET
FEEDER

Metal sheets, automatically separated, picked up and advanced one at a time to feeding—in point of machine to which it is attached at speeds up to 150 sheets per minute.

Should two sheets adhere, they are automatically transferred to a reject tray. Rubber suction mouthpieces and drop rollers prevent scratching.

Standard Feeder handles metal sheets from 14" x 18" up to 36" x 44" between 24 and 38 gauge stock. Feeders for larger size and heavier gauge metal sheets also available.



Continuous reloading avoids machine stoppage. New loads are placed in feeding position, while machine is operating, thus maintaining continuous automation cycle.

Dexter Feeder may be attached to Metal Litho Presses, Coating Machines, Sorting Machines, Shears, Slitters, Sprayers, Punch Presses, Stove Pipe Machines, Buffers and numerous other metal working machines.

Custom built sheet feeders for handling paper, cardboard, corrugated and other types of sheets are available to meet specific requirements. Inquiries invited.

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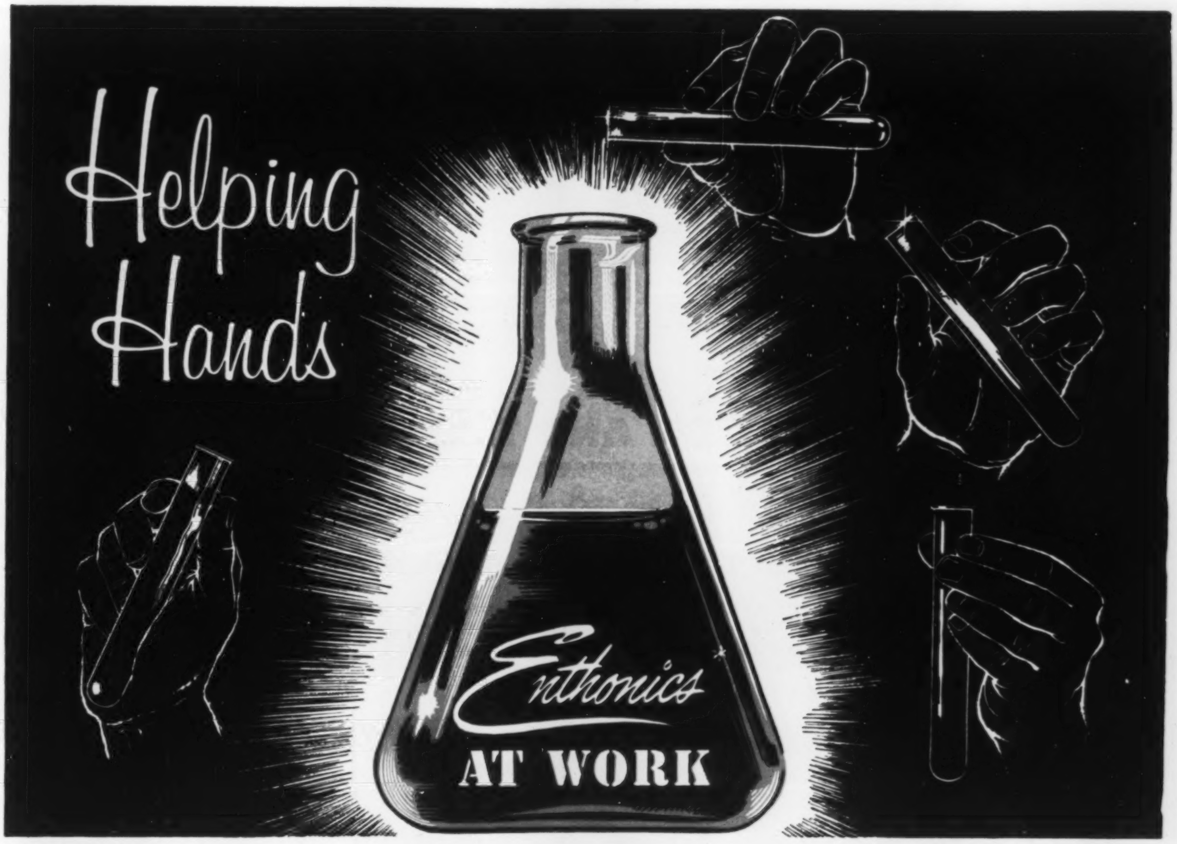

FROM THOUSANDS of TESTS . . .

. . . come the solutions to your metal finishing problems.

If *you* are looking for creative chemistry to supply new methods for the improvement of metal finishing, look to the leader — ENTHONE. Write for the answers to these problems, identifying them by number. If your specific problem is not listed, Enthone will gladly help to find the answer.

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3. HOW TO STRIP NICKEL from copper and brass without attacking the part.
4. HOW TO SHED WATER from metals to prevent staining or spotting during drying.
5. HOW TO TRAP FUMES from hot sulfuric acid pickles.
6. HOW TO STRIP SYNTHETIC ENAMELS from aluminum and other metals without attacking the metal.
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15. HOW TO SOLVENT-CLEAN parts and assemblies with cold non-hazardous solvent.
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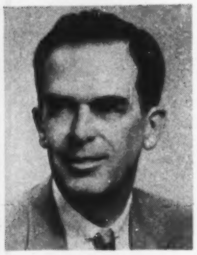


JOHN C. SMACK
Manager, Ultrasonic Sales, Industrial &
Scientific Products Div.
Curtiss-Wright Corp., Caldwell, N. J.

HAMILTON MIGEL
Vice President, Research & Engineering
Magnaflux Corp.
Chicago

INSPECTION AND TESTING

FORUM ON TECHNICAL PROGRESS

Ultrasonics gains in production, maintenance and service testing . . . microhardness testing comes out of the laboratory . . . fluorescent particle and eddy current inspection find wider use in the steel mills . . .

Mr. Johnson . . .

There is a real need for a fine grain, high contrast industrial x-ray film which can be viewed with high intensity viewers at 30 magnifications. Loss in film speed should not be too great.

In high-volume repetitive x-ray inspection, low cost and speed are of the greatest importance. Equipment manufacturers have recently introduced devices which electronically intensify fluroscopic images. These have made fluoroscopy more reliable as far as reproducibility of interpretation is concerned, especially with thicker, more dense materials. This type equipment may prove to be an important tool in production inspection of dense welded and brazed components.

There is a great need to reduce the human element in high volume radiographic inspection. Complete automation of inspection (including interpretation) is the ultimate answer, but because of its high initial expense, it may be several years away.

Mr. Lysaght . . .

In the foreground during the past year was the development of completely automatic hardness testing of small, but not intricate, mass production parts such as gears, splines and tools. Of equal importance was the development of a high speed hand-fed tester that can classify up to 1000 Rockwell tests per hour.

Automation has led several manufacturers to adopt automatic hardness testing of workpieces by the Rockwell and Brinell methods. The testers classify work into one of three categories—correct, too hard, or too soft. Fully automatic Brinell units can test about 800 pieces per hour.

The microhardness machine is finding increasing use in the testing of such things as thin materials, electroplated coatings and decarburization. It is proving a valuable aid for the inspection and control of heat-treatment and cold work. This unit has definitely moved into production testing for such items as watch parts, foil and thin case-hardened materials.

Mr. Smack . . .

A great demand for engineers familiar with ultrasonics developed last year. Universities are recognizing the growth of this industry and are including nondestructive testing methods, especially ultrasonics, in their courses.

Metallurgists may soon be using ultrasonics to determine the elastic properties of metals and to locate overstressed or fatigued areas in critical aircraft and machinery components.

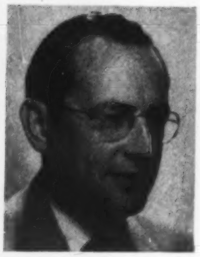
Ultrasonic immersion techniques are being used to test tubing for nuclear reactors. Continued success in these advanced applications will put ultrasonics on a production basis in many more plants throughout the world during 1957.

The need for improved steels for airframes and aircraft engines requires ultrasonic testing of these steels to the same degree the aluminum industry uses it for aircraft quality metal. This means the use of a nondestructive testing system with the capabilities of immersed testing. Automation has been applied to the technique for fast inspection of large areas, such as wing skin surfaces and identically shaped pieces, including wheel-shaped forgings for jet engines.

Mr. Migel . . .

Two major steel mills are using fluorescent magnetic particle techniques to inspect tubing up to 45 ft long and 11 in. in diameter on a production basis. Several more installations of this type will go into operation in 1957.

Much development work has been done on the application of eddy cur-



W. C. HITT
Assistant Chief, Quality Control
Douglas Aircraft Co. Inc.
Santa Monica Div., Santa Monica, Calif.

R. F. HOLSTE
Manager, Product Planning, Industrial
X-ray Dept., General Electric Co.
Milwaukee, and President, SNT

J. E. REIDER
Metals Industry Manager
Industrial Nucleonics Corp.
Columbus, O.

LEONARD REIFFEL
Manager, Physics Research Department
Armour Research Foundation of Illinois
Institute of Technology, Chicago

rent instruments to nuclear equipment. For example, they are being used to scan uranium rods for cracks, seams and porous areas. Another important application is the inspection of the stainless steel and nonferrous tubes used in heat exchangers for nuclear power applications.

Unfortunately, almost all the work on the development and application of nondestructive testing to nuclear problems has been classified. This information must be made available for the industrial nuclear power program. It is also applicable to normal industrial problems.

A symposium to disseminate such information is scheduled (Chicago, Apr. 16, 17, 18). It will be cosponsored by the Society for Nondestructive Testing Inc., American Society for Testing Materials, American Nuclear Society and American Institute of Chemical Engineers. Its principal purpose will be to present and discuss previously classified research and development work on nondestructive testing for our atomic energy program.

Mr. Hitt . . .

This year will see the completion of at least two ultrasonic research projects which are designed to provide data for the interpretation of ultrasonic reflections of discontinuities in aircraft aluminum alloys. Some data on titanium will be available.

Considerable attention is being given to ultrasonic inspection of jet engine parts. It is expected that more research along these lines will be started this year, and that nationally recognized standards will result.

One of the difficulties in chemical milling is the lack of an adequate method to determine the rate of material removal and provide close control of the thickness of the remaining metal. This problem is being resolved by Douglas Aircraft Co. Ultrasonic equipment gives the operator a continuous record of both factors while the material is in the chemical milling tank.

High speed ultrasonic measuring equipment which will take 500 to 800 thickness readings on plates and sheets per hour has been developed by the Ultrasonic Testing & Research Laboratory of Van Nuys, Calif. This equipment is being used on large skins and plate prior to and after chemical or machine milling.

Mr. Holste . . .

Among significant developments is the trend toward the use of x-ray and ultrasonics in airline maintenance and overhaul. This work includes the detection of corrosion in assemblies that do not readily lend themselves to disassembly, cracks, sheared rivets, displaced and damaged components.

A second outstanding trend is the demand for higher sensitivities and detail of the x-ray film or ultrasonic record. It is spearheaded by industries producing equipment for nuclear power and propulsion. These structures can be disassembled for inspection or repair only with great difficulty. Most of them are used in critical areas on equipment that is highly stressed and must stand up over long periods without maintenance. Film sensitivities of less than 1 per cent are required, and are being achieved through improved apparatus with finer targets, better filtration, faster and more responsive film, higher energies and improved techniques.

A third trend is the growing realization that nondestructive testing offers quality dollar control through the inspection of purchased parts, the guidance of casting procedures and the routine inspection of raw materials—before costly machining time is spent on defective materials.

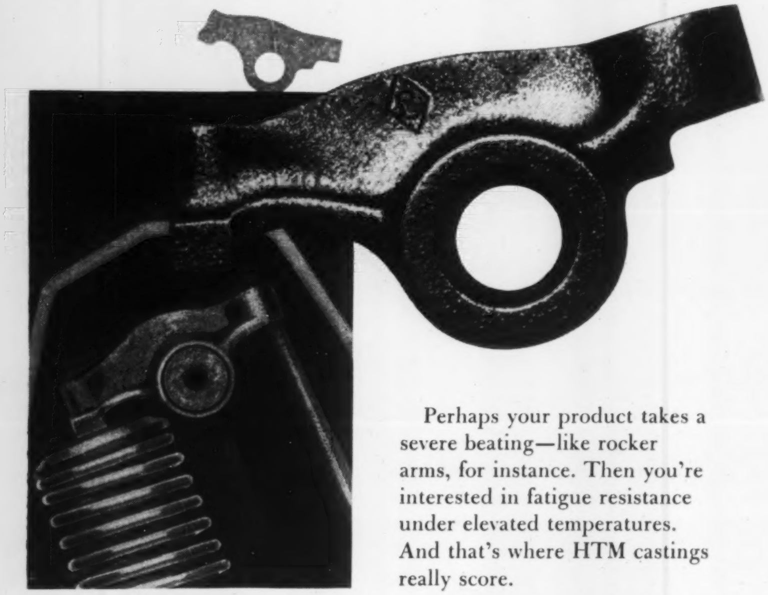
Mr. Reider . . .

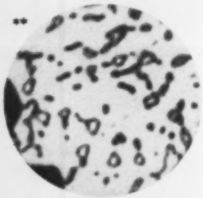
Continuous measurement is bringing improved uniformity to the tin and zinc plate coating processes. Tests by various steel companies indicate that reflection radiation measuring gages show greater accuracy and repeatability or reproducibility than do the destructive chemical stripping tests used to check coating thickness. Isotope gages also scan across the strip and indicate edge to edge as well as machine direction coating weight variations on both sides of the strip.

Now that continuous measurement is available, automatic control of coating weight is also a reality. Data read-out systems are also being developed. They are intended to provide immediate, continuous quality control and costing records.

Mr. Reiffel . . .

We shall soon see high performance solid state imaging intensifiers teaming up with fast photographic film to make radiographic inspection of an entirely new sort possible. It seems certain that an increase in effective speed (measured in hundreds and thousands) will be achieved. This means short exposures or low intensity sources. The





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Perhaps your product takes a severe beating—like rocker arms, for instance. Then you're interested in fatigue resistance under elevated temperatures. And that's where HTM castings really score.

But HTM castings don't stop there. Other major advantages of HTM metal are high fluidity that casts easily into complicated shapes . . . high ultimate strength . . . excellent non-seizing properties . . . *machinability index* of 80-90 (B1112 steel=100).

Look into the advantages of HTM metal. It can improve the service performance—and *sales performance*—of your product.

*Hi-Tensile (Heat-Treated) Malleable

**HTM-228 metal, liquid quenched, x2000, etched

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E. ALFRED BURRILL
Director, Technical Sales
High Voltage Engineering Corp.
Cambridge, Mass.

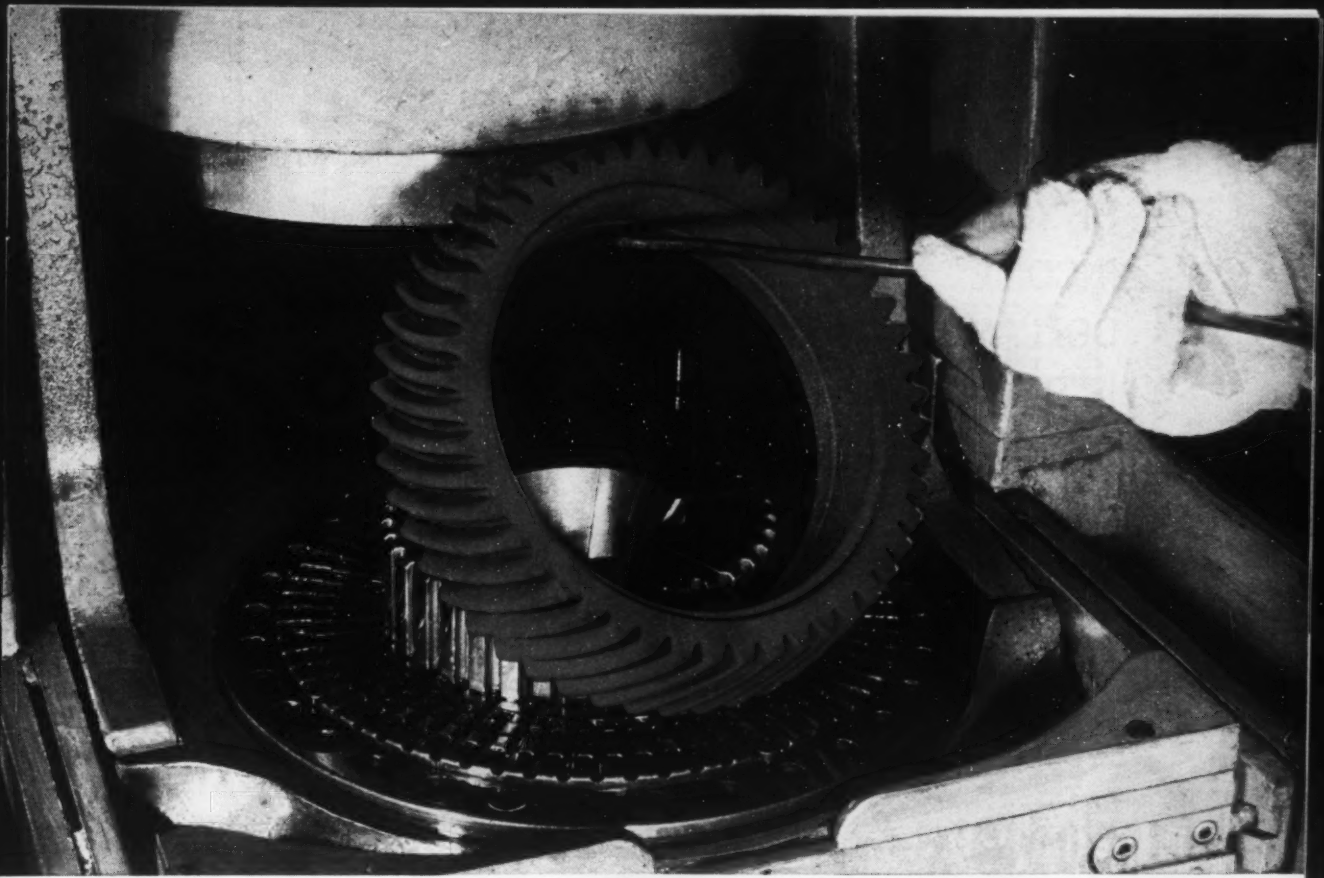
use of low intensity sources, of course, implies greater application of radioactive materials for radiography.

Another area certain to grow in importance is the use of low level counting techniques (possibly combined with short-lived radioisotopes) to provide inspection and testing methods—even those for consumer production which have been ruled out because of potential hazard to the public.

A little more speculative perhaps are the possibilities of using nuclear magnetic resonance and electron paramagnetic resonance for control and testing. There is a host of research methods involving resonance phenomena in magnetic fields which will surely carry over somewhat into the domain of production control. It seems likely that this will occur first either in the manufacture of specialty steels or perhaps in the chemical industry where these resonance techniques could provide a wealth of information on structure and composition which is not available now.

Mr. Burrill . . .

The acceptance of nondestructive testing techniques by industry has sharply increased during the past year. Three factors contribute to this trend: 1. Nondestructive testing can reduce costs and improve the quality of materials and fabricated parts. 2. Rigid requirements for highly stressed components and new materials have arisen in industries serving nuclear-power, guided-missile and aircraft programs. 3. Manufacturers of nondestructive testing equipment are making more versatile and powerful instruments avail-



How to hold close tolerances when you quench gears and other parts

If you make parts like this aircraft transmission gear, you know that warpage or distortion during quenching means losing the time and money you've spent machining the part to close dimensional tolerances.

You can avoid such costly losses with Gleason Quenching Equipment.

The hot gear above, for example, is being set on the lower die of a Gleason Quenching Press. A button is pressed and the automatic quenching cycle is started. The lower die is swung back into the quenching position and the upper die descends rapidly, aligning the part while it is still in the plastic state.

The dies securely clamp the gear, but are so designed to permit it to contract in the normal manner, while still holding the gear true.

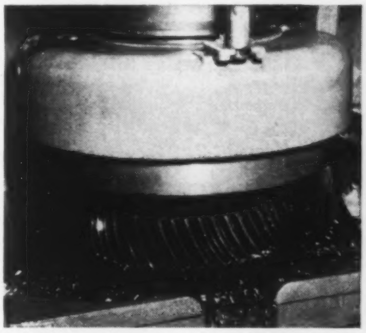
Carefully controlled, metallurgically correct oil circulation hardens the gear to perfection.

Post-quench tests show the gear meets all specifications.

You can give *any* part, regardless of shape, the same distortion-free quenching.

Three sizes of the Gleason Quenching Press harden parts up to 36″ diameter. Another press automatically hardens and straightens shafts and shaft parts up to 40″ in length.

For literature and recommendations on the press and die equipment that fit your products, send us blueprints.



The Gleason Quenching Press forces oil uniformly over and around the part, assuring the correct hardness and distortion-free quenching.

GLEASON WORKS

Builders of bevel gear machinery for over 90 years

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Please rush my copy of your newest booklet entitled, "The Key to Rust Prevention," which tells about the problems of rust, cleaning my products, materials in corrosion preventives and how to choose a rust preventive.

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LOUIS A. WELT
President
Steel City Testing Machines Inc.
Detroit

M. F. HASLER
President
Applied Research Laboratories
Glendale, Calif.

able. Emphasis is on high quality results, portability and low cost.

Demand and interest in supervoltage x-ray equipment have been unprecedented. It is apparent that the advantages of constant-potential x-rays with great penetrating power can assist in meeting the needs of industry. This equipment is used for high production inspection and critical analysis of new materials.

Mr. Welt . . .

We are particularly concerned with the testing of physical properties of metals. In this field, we feel that the trend in automation is toward special equipment which will test a whole component nondestructively.

For example, many of the hardness testers we have manufactured recently are large enough to take an entire forging or casting, so that 100 per cent inspection of the piece which will be subjected to automatic machining is possible. This allows for 100 per cent inspection, but the testing operation itself is still not intended to be automatic.

Mr. Hasler . . .

This year will show some important advances in spectrochemical instrumentation for the testing and in-

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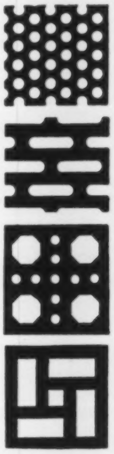
For the top three floors of the beautiful new Socony Mobil office building in New York City, we furnished more than 40,000 sq. ft. of perforated stainless steel wall panels.

from Sky Scrapers to Spin Driers and Juke Boxes

What do YOU require in Perforated Metal?

Already there are thousands of established applications and new requirements are developing every day . . . in such fast growing fields as Air Conditioning, Atomic Energy, Aviation, Chemical Processing, Electronics, Household Appliances, Noise Control, Smoke Abatement, Space Heating, etc.

We produce metal sheets and parts with any desired type or size of perforation and have hundreds of specialized tool arrangements to assure prompt, accurate service at competitive costs. Catalog 39 contains complete working data and shows many interesting applications in its 32 large illustrated pages. Write, today, for a free copy.



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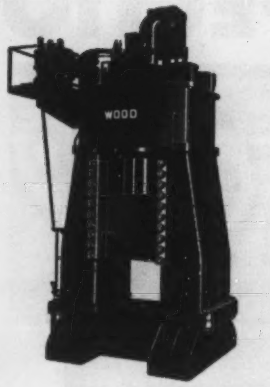
Los Angeles Area



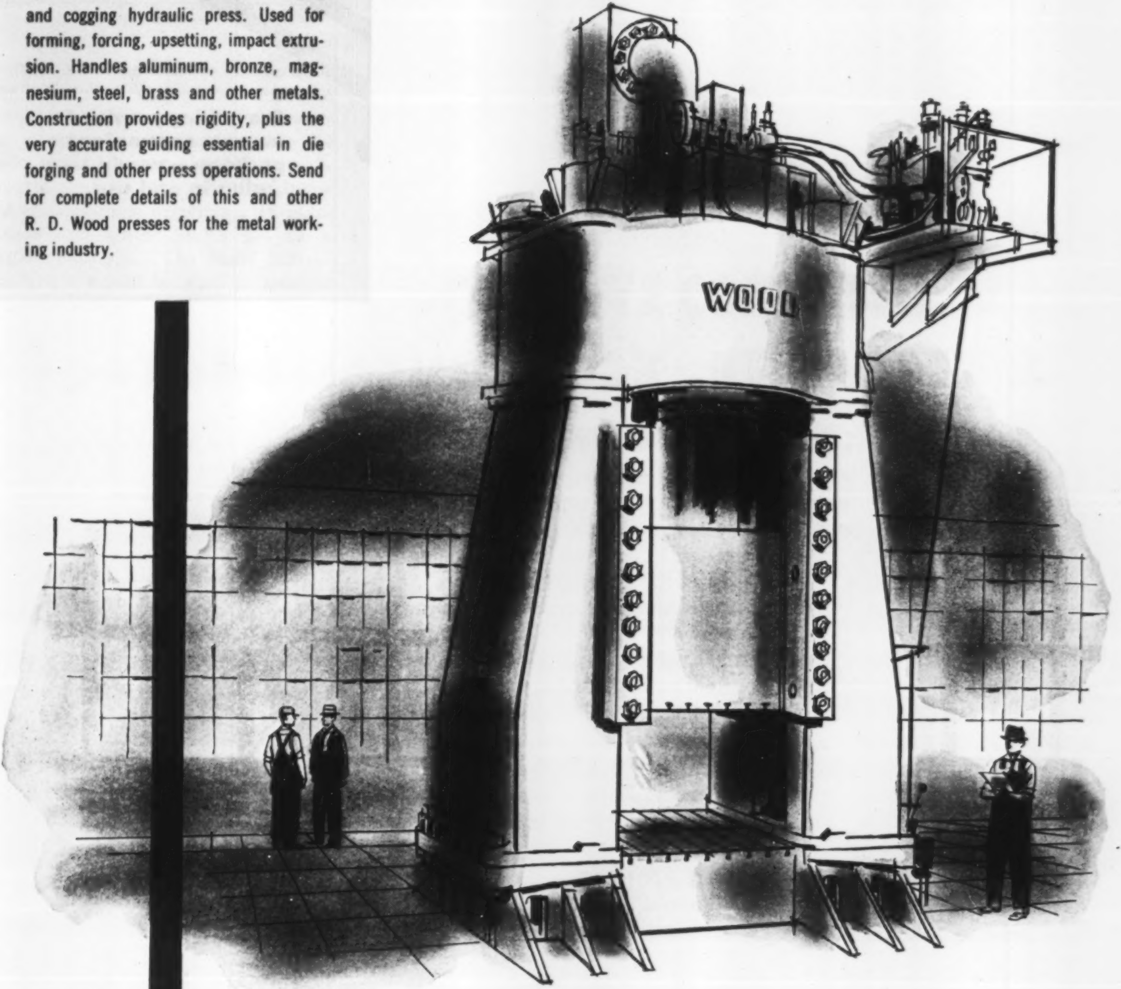
3,000-ton R. D. Wood high speed forging and cogging hydraulic press. Used for forming, forcing, upsetting, impact extrusion. Handles aluminum, bronze, magnesium, steel, brass and other metals. Construction provides rigidity, plus the very accurate guiding essential in die forging and other press operations. Send for complete details of this and other R. D. Wood presses for the metal working industry.

150 years of excellence

This is not an empty claim. It's a fact and a challenge.

In more than 150 years of service to industry, R. D. Wood's name has never appeared on a press of inferior quality.

You can *see* the proof of R. D. Wood quality in the precise design, select materials, and sound craftsmanship that distinguish our presses. And you can *see* the results of this quality in smooth, dependable performance, increased production, economical maintenance.



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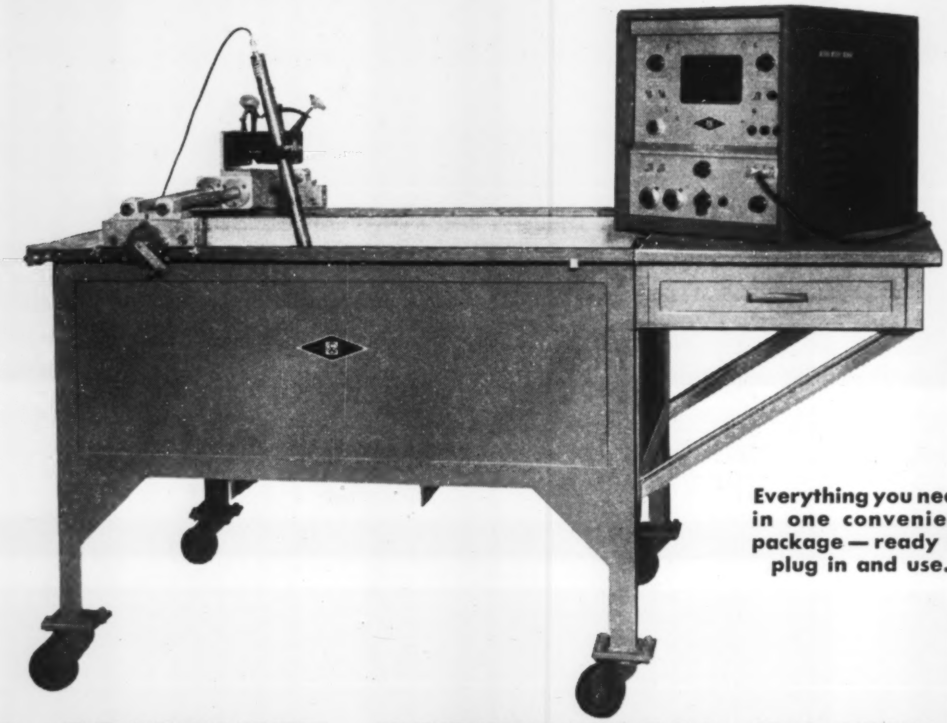


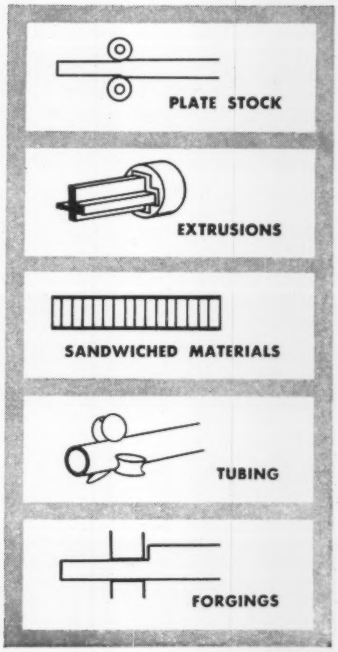
Everything you need in one convenient package — ready to plug in and use.

A COMPLETE, ECONOMICAL PACKAGE for immersed non-destructive testing

Now Curtiss-Wright offers all the benefits of immersion ultrasonic testing of metal without the expense of purchasing an assembly of several costly separate units. This new low cost "package" combines in a self-contained single unit the Immerscope — the heart of the system — a four-foot tank, search tube and rack, precision manual manipulator, longitudinal and transverse manual scanning mechanism and a complement of crystals. Here is a complete immersion testing, quality control installation ready to operate, whether in laboratory or light production — a system that can be readily expanded, with only minor investment, for more demanding production applications.

The technique is simple. Metal parts are immersed in water in the tank. Ultrasound is applied to penetrate the metal. Defects present will reflect the sound. Those echoes are presented as pips on the cathode ray tube of the Immerscope. Flaw detection is precise and positive.

This Ultrasonic Test Unit Model PT 1001 lowers inspection costs, stabilizes high standards in quality control, and permits analysis of fabrication techniques. Complete information on request. Our local representative is available to discuss your problem.



INDUSTRIAL AND SCIENTIFIC PRODUCTS DIVISION
CURTISS-WRIGHT
CORPORATION • CALDWELL, N. J.

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C. G McCLURE
Application Engineer
Sperry Products Inc.
Danbury, Conn.

spection of steel and its products.

In the field of optical emission analytical instruments, a direct-reading vacuum spectrometer will be made available. It should allow 2-minute analysis of carbon, sulphur and phosphorous, together with manganese and silicon, in steels as a single operation. The same instrumentation should be able to analyze gases in metals, such as hydrogen, oxygen and nitrogen. But procedures for gas analysis will undoubtedly follow those for carbon, sulphur and phosphorous.

X-ray analyzers will make possible continuous gaging of a wide variety of coatings on metal products, such as tin, zinc and aluminum on steels. The same type instrumentation will allow continuous analysis of almost any chemical element which might be of importance for quality control. This x-ray equipment will go far toward introducing continuous analytical and gaging control.

Mr. McClure . . .

Specifications which tailor ultrasonic testing to individual needs are increasing in number. Such a move is necessary to maintain uniformity of inspection standards in this growing field. National engineering societies are working toward the consolidation and refinement of individual requirements into general specifications of wider applicability.

Equipment is being constructed to operate more rapidly, cover greater areas and record defects or give an alarm when they are present. The reliability of such equipment is mandatory. Automatic control and programming are being incorporated.

Refinements in search units, inspection equipment and methods of

Ask Standard

how to cut costs with conveyors

Standard limit-switch-controlled Automatic Reciprocator is one of two used to form 200-ft. overhead detour of dehumidifier assembly line.

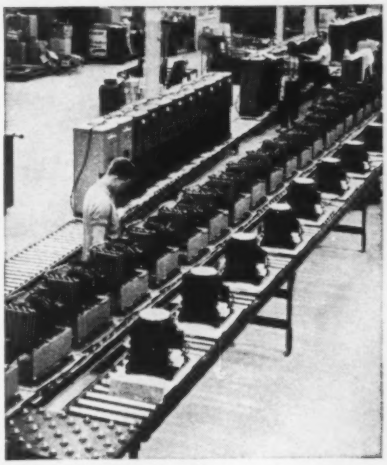
"COMPLETE CONVEYORIZING" . . . what it did in a smaller plant

Products at Ebco stay on conveyors until packaged and sent to shipping.

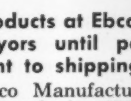
Ebco Manufacturing Company — employing 275 people to produce water coolers, beverage dispensers and dehumidifiers — has realized substantial savings by completely conveyorizing their operations. Ebco engineers planned for an orderly conveyor system when developing plant layout and building design; consequently conveyor system costs were kept "low" and resulting efficiency is "excellent."

Similarly, it will pay you to take another close look at your present conveyor system. Standard specialists will be pleased to help you make evaluations . . . recommend the proper equipment and its application to meet your specific needs.

STANDARD CONVEYOR COMPANY, North St. Paul 9, Minnesota. Sales and Service in Principal Cities.



Gravity roller conveyors like this, used for Ebco's assembly lines, are inexpensive, easy to set up, and economical to maintain.



For details on Standard Conveyors of all types, contact the Standard representative listed in your classified phone book or write direct. Ask for Bulletin Y-1.

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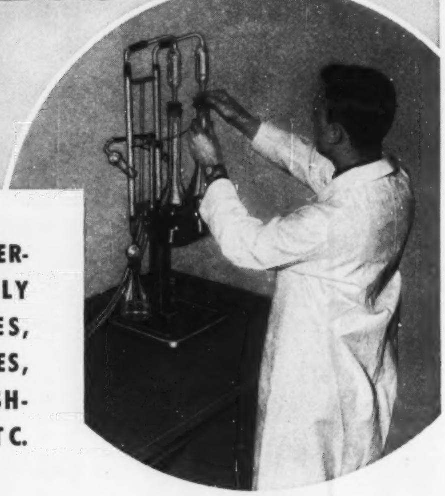
50 years of conveyor experience
GRAVITY & POWER CONVEYORS



THIS MAN MEANS BUSINESS

Chief Sandusky

FERROUS AND NON-FERROUS CENTRIFUGALLY CAST ROLLS, SLEEVES, TUBES, LINERS, CHUTES, RETORTS, RINGS, BUSHINGS, BEARINGS, ETC.

His business is product improvement. He's your assurance that every centrifugal casting which leaves our plant has been scientifically developed and quality checked through every step of its production.

Creative research has been the backbone of Chief Sandusky customer service for over forty years. That's why today's ferrous and non-ferrous centrifugal castings are the finest available.

When your needs, either standard or special, call for close-grained cylindrical castings that must resist heat, corrosion, or abrasion, make it your business to call Chief Sandusky. Our technical aid is as close as your phone.

An additional service is machining facilities for turning, boring, and drilling.

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CENTRIFUGAL CASTINGS
FERROUS AND NON-FERROUS
SANDUSKY FOUNDRY AND MACHINE CO., Sandusky, Ohio

WILLIAM D. KIEHLE
X-ray Div.
Eastman Kodak Co.
Rochester, N. Y.

application continue. New crystalline materials for transducers promise improvement: New methods of using them promise even more remarkable results.

For example, the Ultrasonic Attenuation Comparator developed by Dr. Rohn Truell of Brown University is being made available to industry by Sperry. This equipment, operating at test frequencies as high as 200 megacycles per second, permits the evaluation of small and subtle changes in the structure and composition of materials.

Mr. Kiehle . . .

The demand for increased sensitivity in industrial radiography is occasioned by new developments in atomic energy, guided missiles, jet aircraft and electronics. Five years ago, 2 per cent sensitivity was considered adequate for most radiography. Today, with the need for higher air speeds and smaller weight-to-strength ratios, the safety factors in metals must be carefully revised. Since these metals are being pushed to their limits, many contractors are seeking radiographic sensitivities of 1 per cent or less. To obtain this goal, films of finer grain and higher contrast are required, along with precise techniques of exposure and accurately controlled methods of processing.

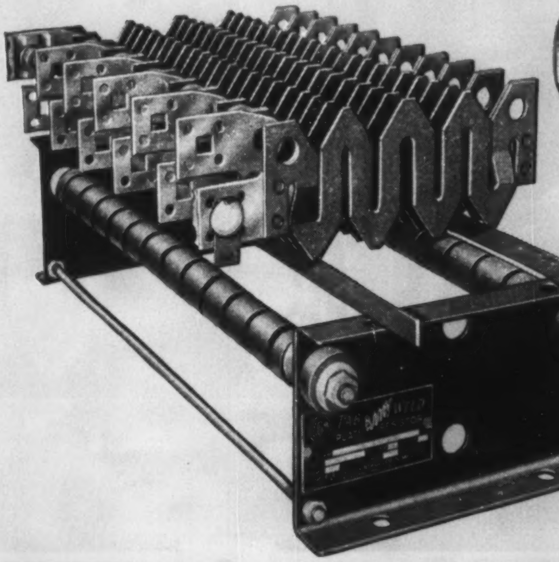
Along with the demand for increased sensitivity has come a demand for greater production and more efficient methods. By increasing film speeds without sacrificing quality, some manufacturers have been able to reduce exposures by 50 per cent. At the same time, more accurate control of the processing cycle is being provided so that high radiographic sensitivity is not sacrificed in high-speed production.

HANDS OFF!

EC&M TAB-WELD RESISTORS REQUIRE *MINIMUM* MAINTENANCE

Only EC&M TAB-WELD PLATE RESISTORS are both bolted and welded for constant current path Unlike other resistors, they do not require periodic tightening of clamping nuts to compensate for loss of pressure caused by alternate heating and cooling. Grids are offset and mating ends are spot welded. Tap-plates are also welded into place at close intervals along the grid assembly.

This exclusive EC&M construction offers 4 big advantages on heavy duty motor applications: (1) stabilized ohmic value (2) no burning at grid-eyes or at tap-plates (3) easy tap-shifting for best motor performance and (4) long life with virtually no maintenance!



FEATURES THAT REALLY COUNT!

- Nonbreakable
- Corrosion-resistant alloy steel
- Negligible resistance change between cold and maximum working temperatures
- Offset resistor ends spot-welded
- No burning at grid-eyes
- No burning at taps
- Small adjustments in resistance value easily made
- Insulating spacers remain dimensionally stable
- No periodic tightening of clamping nuts
- All standard sections same size
- Double insulation to ground
- Fast connection to any tap-plate

***Write* for illustrated Bulletin No. 942-B**
Complete data on EC&M TAB-WELD RESISTORS

SQUARE D COMPANY
EC&M DIVISION • CLEVELAND 28, OHIO

7404

Ingersoll-Rand steam-driven compressor pays for itself in three years

MOTOR PRODUCTS CORPORATION

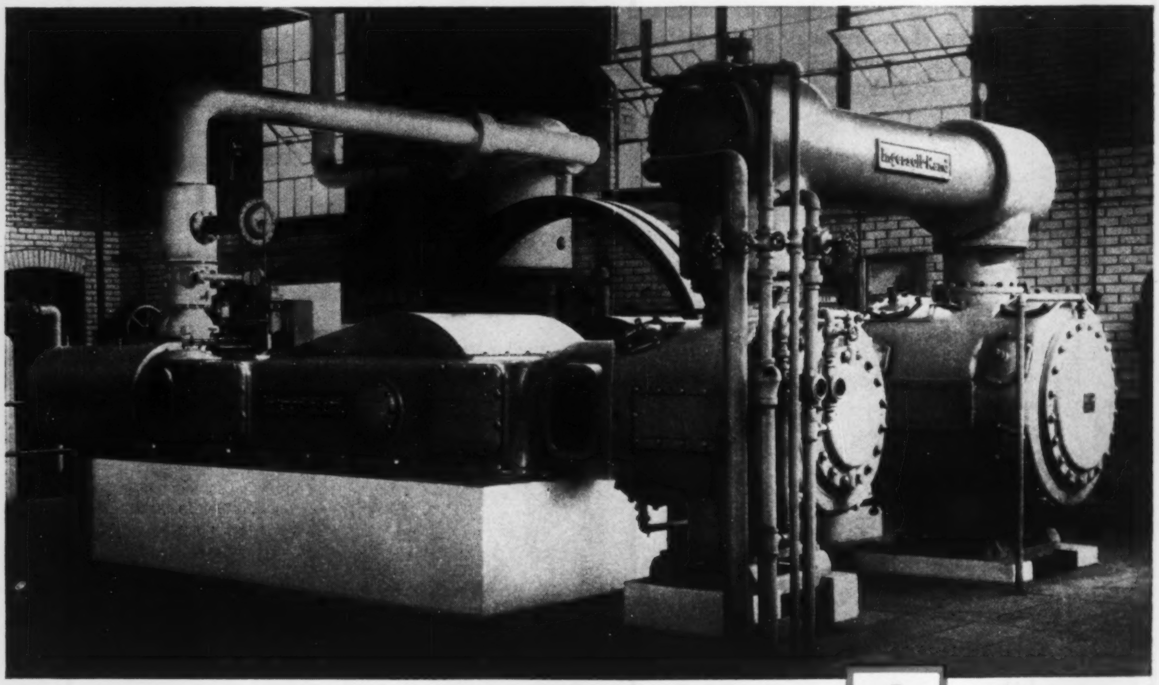
When Motor Products Corporation modernized their main Detroit plant, they installed an Ingersoll-Rand XPV steam-driven compressor at the advice of their consulting engineers, Boddy, Benjamin and Woodhouse, Inc. This modern compressor improved plant steam balance by utilizing available steam.

The exhaust steam from the compressors is used for building heating and feedwater heating. At full load, this compressor saves $26,000 a year in power costs over the old electric-driven unit it replaced. This saving will repay the original cost of the compressor in only three years.

Not every compressor can save this much in a single installation, but by careful selection, application and control, Ingersoll-Rand compressors can be adapted to give the utmost economy under any given set of conditions. Your I-R representative will help you find the compressor and conditions that give the most air power for your investment.

Ingersoll-Rand steam-driven compressors are available in sizes from 10 to 2500 horsepower. Other types are available in sizes from ½ to 6000 horsepower, pressures to 35,000 psi and vacuums. All units are built to the exacting Ingersoll-Rand standards of durability and economy of operation.

This 1950 cfm XPV steam-driven compressor furnishes 100-psi air at the Motor Products Corporation plant in Detroit, Michigan.



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DRIVES AND CONTROLS

FORUM ON TECHNICAL PROGRESS

Punch card programming for rolling mills opens up broad new field for automatic control . . . Simplified control components with greater reliability needed . . . New NEMA standards gain favor in direct current field . . .

Mr. Van Nort . . .

The analog computer ranks first among developments which have helped drives and controls to advance at such a rapid rate. It also insures continued growth. In a matter of minutes, several different drive systems can be applied to a machine or process to determine which is the one best system. Selection of a completely new drive system or component can be utilized with confidence. This all takes place before a single machine is built.

This new design concept means that the metalworking machinery user or designer can look forward to better control and drive systems. They will be more reliable, have higher speeds and occupy less space. They will help him solve tomorrow's problems.

New product development has kept pace. Examples: High speed motors with low inertia and dynamic response and rugged, fast-acting electronic regulators.

Mr. Hoge . . .

Control and power circuits of tomorrow will have fewer and fewer moving parts and will be as precise or as fast in response as we might require. A revolution in manufacturing processes and production control is taking place and will accelerate.

While we let our imagination play, let's not forget the importance of basic control schemes. For years, we will need reliable controls designed by practical control engineers. With new tools and new concepts, application engineering and good circuitry have become more, not less, important. Control in a processing line is as useful as the circuits that interpret and solve the problems of that line.

Our promise for the future is not all in dramatic discoveries. Widespread interest in engineering education is the best guarantee that the control industry will measure up to the job of enormously increasing production, lowering costs and assisting in obtaining a higher standard of living.

Mr. Miller . . .

Static switching and card programming systems have recently been placed in operation in the steel industry. Automatic gage control has become a required function on all new tandem cold strip mills.

Static switching and regulating systems were used to replace the master motor-operated rheostat and its positioning control on a 4-stand tandem cold strip mill. The static units can replace relays and provide lower maintenance and faster operation on difficult applications.

Standard prepunched accounting cards are being used to program roll opening and main drive motor speeds for each pass through a reversing roughing mill. The card is inserted by the roller into a heavy duty card reader located in the mill pulpit. Operation of a sequencing pushbutton is all that is required to obtain automatic and accurate setting of roll opening and mill speeds. Operating personnel are enthusiastic about the speed of response, accuracy, flexibility and the quality control possibilities.

During the coming year, card program control will find wider use on reversing, slabbing, blooming and plate mills, and roughing mills. Sensing devices will assist the basic numerical control system in sequencing the over-all operation.

Mr. Ross . . .

Design of direct current motors and generators, key power sources in many automated processes, has kept pace with industry's current and future requirements. New direct

New ARMSTRONG Armide CARBIDE INSERT TOOL HOLDERS

The advantages of Carbide Cutters with the Multiedged "throw away" ARMIDE inserts

ARMSTRONG CHICAGO U.S.A.
STYLE TR
Holds Triangular (6-edge) "Throw Away" Inserts

STYLE SR
Holds square (8 edge) Throw Away Inserts
ARMSTRONG

Write for Bulletin CIT

New ARMSTRONG Armide Carbide Insert Tool Holders hold multiedged, throw away Armide inserts. They end tool grinding and reduce down time. After an edge dulls, a slight turn of the clamping screw permits rapid indexing of the insert to a new cutting edge. Triangular inserts have 6 cutting edges; square inserts have 8 edges. They are available in three grades—Armide 350, 370, or 883.

ARMSTRONG Armide Carbide Insert Tool Holders are furnished either "Right Hand" or "Left Hand" in the two styles illustrated, each in 3 sizes.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
5279 W. ARMSTRONG AVE. • CHICAGO 30, ILL.

Buy ARMSTRONG TOOLS from your Industrial Distributor

GOES OVER BIG for wheeling and dumping heavy materials

Costs Less per Year

Specify Sterling No. 119 HEAVY-DUTY CART
Pneumatic-tired wheels or steel wheels

Here's a cart that's "tailor-made" for wheeling coal, scrap, chips, turnings, borings and similar heavy materials. All-steel, completely welded and reinforced. Made extra strong and rugged for heavy-duty service. Dumps easily. Rests securely in any one of the three positions shown here. Available with steel wheels or pneumatic-tired wheels . . . plain or roller bearings.

Write for Bulletin or see nearest dealer.

Some areas open for dealerships. Write . . .

STERLING WHEELBARROW CO., Milwaukee 14, Wis.

A HALF CENTURY OF PROGRESS

Sterling WHEELBARROWS
Look for this Mark of STERLING Quality

A 7846-⅓R

JOHN C. SEARS
Executive Secretary
American Gear Manufacturers Association
Washington

current machines, built to new NEMA standards, provide more horsepower per pound, sharply increased speed of response and lower inertia. Higher temperature machines with correspondingly higher classes of insulation have been important in making these advances possible.

In-plant maintenance of direct current machines is being simplified by greater standardization of design. Many applications, previously requiring special machines, are using versatile units of standard design—for example, planer and broach drives.

The trend toward greater use of packaged drives continues, particularly in the larger sizes. Packaged drives are being applied on draw benches and smaller nonferrous rolling mills. Easier installation, reduced floor space and unit responsibility for the equipment are the principal factors contributing to this trend.

Mr. Sears . . .

The gear user is learning that he can greatly reduce down time costs by the selection of higher quality, closer tolerance gearing. This demand is in turn making it attractive and advisable for gear manufacturers to modernize, improve and replace equipment, even though such equipment might have years of useful life remaining in it.

Our industry is alert to the mushrooming demands for higher pitch line velocities, higher loads transmitted through smaller gears and gearing that will perform satisfactorily at unheard of revolutions per minute, at temperatures in high and

Need a Limit Switch?

WHAT'LL YOU HAVE?

Here are samples of A-B quality limit switches—a line so complete it will satisfy your every requirement!

OILTIGHT

Bulletin 802T—For high-speed production machines. Sealed to protect the switch against oil and coolants.

GENERAL PURPOSE

Bulletin 801—Standard or heavy-duty rating, with roller, push type, or fork lever action, and slow or snap action contacts.

PRECISION

Bulletin 802—For applications where mounting space is small and operating motion is measured in thousandths of an inch.

Bulletin 803 Cam Limit Switch used on rotating machines to open and close circuits at any desired angular position.

ALLEN-BRADLEY

QUALITY

MOTOR CONTROL

A-B Quality

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Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. • In Canada—Allen-Bradley Canada Ltd., Galt, Ont.

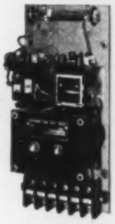
PILOT CONTROLS?

Yes... Allen-Bradley covers the field!

PHASE FAILURE AND PHASE REVERSAL RELAYS

BULLETIN 812

Style A disconnects motor if one phase of power circuit fails. Style B protects against phase reversal, as well.



No matter what your needs for pilot control devices may be . . . refer to the new Allen-Bradley "handy" catalog . . . you will usually find what you are looking for. If not, please write Milwaukee, or contact your nearest Allen-Bradley representative.

All pilot controls are made to Allen-Bradley standards of quality. All of them have silver alloy contacts that require no service attention. You'll find it saves service time and money to specify Allen-Bradley.

OILTIGHT PUSH BUTTON STATIONS

BULLETIN 800T

For machine tool applications, to keep oil away from the contacts. Available in flush, surface, or pendant mounting.

PRESSURE CONTROLS

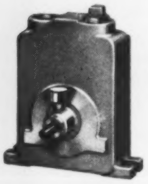
BULLETIN 836

For noncorrosive liquids, vapors, gases, from 30 in. of vacuum to 700 psi. Accurate, rugged, compact, and attractive appearing.

PLUGGING SWITCHES

BULLETIN 808P

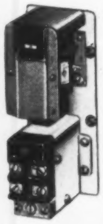
Used with a simple reversing switch, it provides quick, automatic stopping of machines driven by squirrel cage motors.



TIMING RELAYS

BULLETIN 849

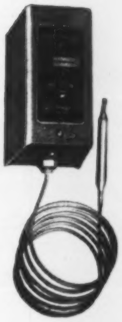
A reliable and accurate pneumatic timer with a range of 1/6 to 180 seconds. Many arrangements. Motor driven, electronic and oil dashpot timers also available.



TEMPERATURE CONTROLS

BULLETIN 837

For temperatures from —45°F to 440°F. Metal bellows operates snap action precision switch with pure silver contacts.



FOOT SWITCHES

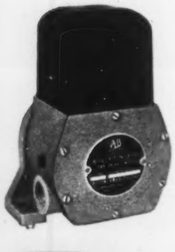
BULLETIN 805

For operating punch presses, riveting, welding, and many other machines. Switch has snap acting, normally open and normally closed silver alloy contacts.

ZERO SPEED SWITCHES

BULLETIN 808

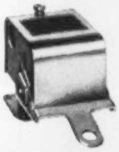
A plugging switch that brings squirrel cage motors to zero speed quickly, without any reversal of direction.



FLOAT SWITCHES

BULLETIN 840

Provide automatic control for motors operating tank or sump pumps.



PRESSURE SWITCHES

BULLETIN 830

For domestic water pumps, and commercial and industrial air compressors.

ROTARY SWITCHES

BULLETIN 806

Cam operated switches for the selection or transfer of various control circuits. Silver alloy contacts.

ALLEN-BRADLEY

MOTOR CONTROL

QUALITY

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Ltd., Galt, Ont.

Send for the new 7th Edition of the Allen-Bradley Handy Catalog. It is a veritable encyclopedia of reliable motor control.

1-57-MR

W. C. DENISON
President, Denison Engineering
Div., American Brake Shoe Co.
Columbus, O.

low ranges, with little or no lubrication.

The biggest gear production year in history was 1956. Current backlogs indicate that 1957 will equal or better that mark.

Mr. Denison . . .

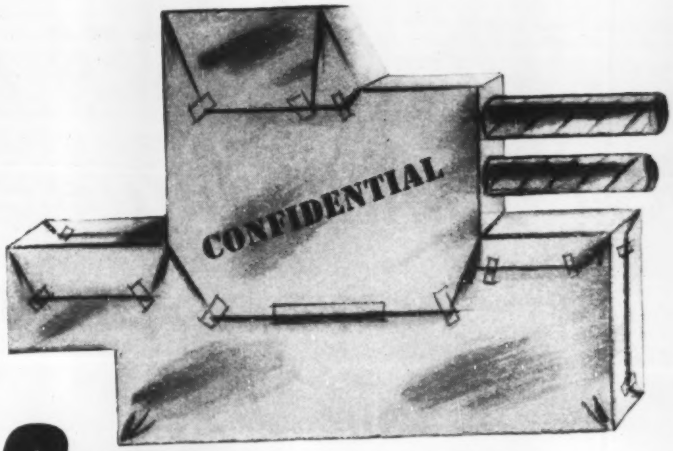
Machine tool builders and suppliers must do more than produce the best product possible. They must provide on-the-job service, maintenance and installation engineering for those tools and products.

With automation a reality, machine tools, controls and other items have become more and more complex. To make it possible for the customer to gain full use of a product, it has become the duty of the manufacturer to follow his product from the drawing board to the production line, then into his customer's plant. The manufacturer must provide installation engineering. He also must service and maintain his products to guarantee full usage.

Keeping production running is a moral as well as a contractual obligation. Increased speed of maintenance and service is the manufacturer's way of meeting that obligation.

During the last year we opened regional offices. At these branches trained service men are immediately available to help with hydraulic production problems.

The branches carry a wide inventory of presses, parts and accessories for over-the-counter sale. Each branch has a sales demonstration laboratory in which Denison equipment can be applied to actual production problems, and hydraulic components tested.



Sure we built it...

—and we're proud of it but we can't show it!

We worked out many of the design problems from the user's basic idea . . . adapted some applications learned by experience in an entirely different field . . . suggested ideas and procedure to meet his specific requirements . . . then built 16 units. Result? — the customer saw his dream come to life, speeding his entire plant's production, simplifying handling, and lowering man-hour costs.

But that's as much as we can tell about his process because it was a "strictly confidential" job.

If you need help on special machine design and production, you'll find us loaded with "ideas-PLUS" . . . ideas, yes, PLUS the know-how, experience and facilities to handle the entire job in one plant. And if you want your processes or plans held in confidence, we're accustomed to working that way, too!

Our Facilities Include:

The South's largest modernly equipped machine shop, a Meehanite foundry, complete fabrication shop, and a huge assembly department — all in our 10-acre Birmingham plant.

Call, wire or write your nearest Continental office

CG-5707

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CONTINENTAL GIN COMPANY
BIRMINGHAM, ALABAMA

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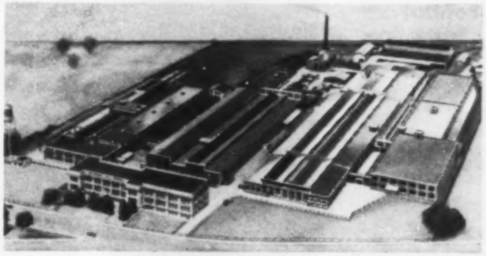
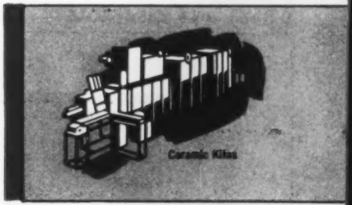


BRAND-NEW IDEA in heat treating furnaces



o o proving again . . .

FOR CARBONITRIDING, BRIGHT HARDENING, CARBURIZING OF SMALL METAL PARTS

This is a completely new furnace, an exclusive Lindberg development. It is the first time induction heating has ever been offered in a heat treating furnace. No elements, no burners, no electrical or gas connections in it. Heating efficiency is high and the furnace can be brought to hardening temperatures in 17 minutes from cold. Temperature control is highly accurate, eliminating temperature override and lag for all practical purposes.

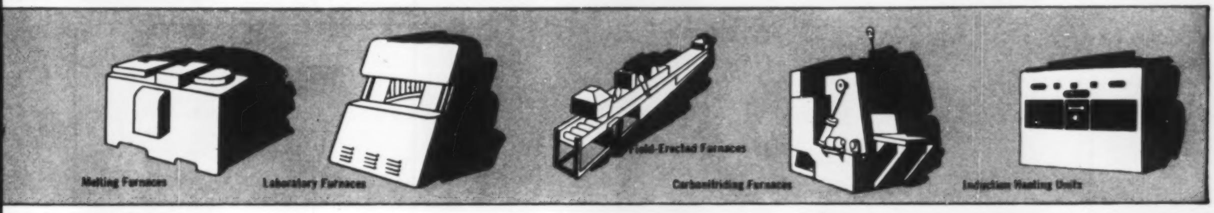
The Induct-O-Ring's circular shape eliminates door-opening heat and atmosphere losses and saves floor space. Work load is automatically charged and moved through the work chamber by a gentle, quiet, reciprocating movement of the furnace. The furnace is completely adaptable to automatic production processes, where its precise heat control, negligible maintenance and dependable operation are of particular importance.

- **No elements, no burners**
- **No gas or electric connections in furnace**
- **Built like a fine machine tool**
- **Precise temperature control**
- **Very low maintenance**
- **Quiet, automatic, trouble-free**

LINDBERG

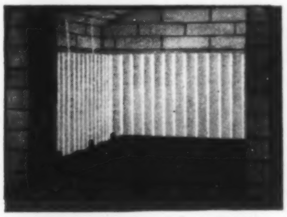
induct-O-ring*

*U. S. and foreign patents pending



. . it's better to talk it over with LINDBERG

If you are concerned with the application of heat to industry it makes good sense to talk it over with the most widely experienced experts you can find. We believe we have them here at Lindberg. Our only job is developing industrial heating equipment and we offer the most complete line in the field; heat treating furnaces, melting furnaces, high-frequency induction units, ceramic kilns; big ones, small ones, built in our own plant or field-erected. This gives us the experience and know-how to come up with something really new, like this revolutionary Induct-O-Ring furnace, time and time again. So take your industrial heating problems to the experts. Our engineers and technicians can have the right answer. Talk it over with Lindberg.



Another Lindberg achievement! The use of electricity in carbonitriding and carburizing furnaces has been made completely practical by Lindberg's recent development of the CORRTHERM electric heating element. This element is now being used in many furnace installations where ordinary electric heating elements could not operate successfully.

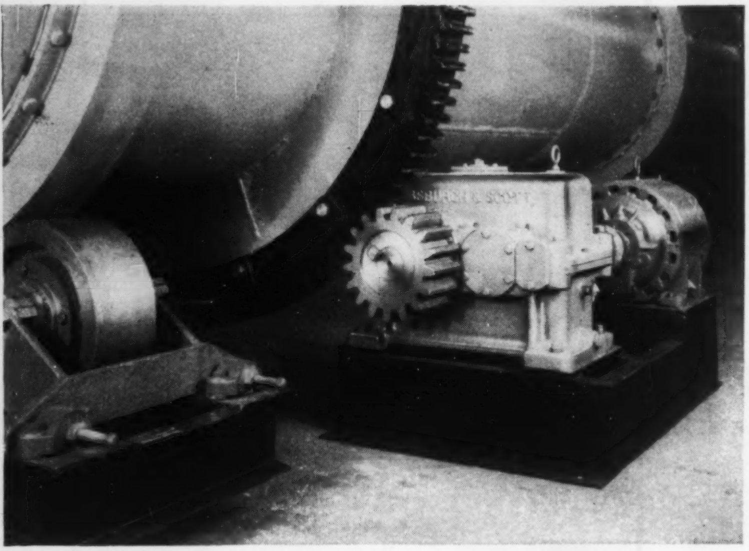
For fuel-fired furnaces, another important development, the famous "dimple" vertical radiant tube was created by Lindberg. This lightweight, easily-changed tube provides a big advance in furnace efficiency and effects a marked saving in operation and maintenance costs. Minimizes shut-downs and costs for tube changes.

Through the years Lindberg research and development laboratories have originated and perfected many other important heating processes, developments such as the Cyclone tempering furnace, automatic control of carbon potential in furnace atmospheres, 60 cycle induction melting and completely automatic ceramic kilns.

Many important Lindberg developments have come as a direct result of some good customer's need. With the customer's cooperation Lindberg engineers have frequently provided an answer to some pressing production problem. You will benefit, too, whether you need some specific Lindberg equipment or have an industrial heating problem that needs a solution if you'll just talk it over with Lindberg. Call your nearest Lindberg Field Representative. There's one (see your phone book) in every major industrial center.

LINDBERG ENGINEERING COMPANY
2441 West Hubbard Street, Chicago 12, Illinois
Los Angeles Plant: 11937 S. Regentview Ave., at Downey, Calif.

Associate Companies: Lindberg Industrial Corporation, Chicago • EFCO-Lindberg, Ltd., Montreal, Canada • Lindberg Italiana, Milan, Italy • The Electric Furnace Company, Ltd., Weybridge, Surrey, England • Etablissements Jean Aubé, Paris, France • Lindberg Industrie Ofenbau, Gross Auheim, Germany • Toyo Menka, Tokyo • Lindberg Engineering Company (Australia) Pty. Ltd., Melbourne

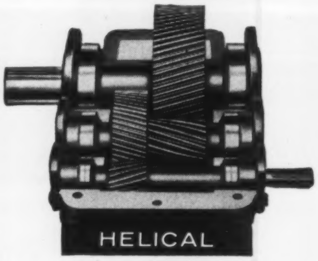


H&S speed reducer delivers 10 maintenance-free years of continuous service

Manufactured by the Louisville Drying Machinery Unit of the General American Transportation Corp., this Barite Dryer was installed in 1945. The H&S Size 2400 Speed Reducer and H&S Drive Pinion and Gears that you see above have given over 10 maintenance-free years of continuous moderate-shock service.

H&S Herringbone, Helical and Worm Gear Speed Reducers have been serving heavy industry for 26 years. If you are looking for dependable, trouble-free power transmission, won't you contact your H&S representative or write us today?

H&S Reducers are available in single reduction units in ratios up to 100 to 1; in combination units up to 700 to 1; and in double reduction units up to 10,000 to 1.



H&S Gears: There are 9 types for you to choose from! Spur Gears are cut up to 144" diameter and 1 D.P. Write today on company letterhead for the new H&S Gear Catalog No. 57.

THE HORSBURGH & SCOTT CO.
GEARS AND SPEED REDUCERS
5112 Hamilton Avenue
Cleveland 14, Ohio

W. H. BENNETT
President, Hydraulic Press Mfg. Co
Div. of Koehring Co.
Mt. Gilead, O.

JOSEPH E. OTIS JR.
President
Dodge Mfg. Corp.
Mishawaka, Ind.

Mr. Bennett . . .

From a design standpoint, higher speeds can sometimes be met with higher horsepower input, but there comes a point of diminishing return in spite of size and modification. It then becomes the problem of evaluating the complete operation to obtain maximum output. We see the trend toward entire lines of press and allied equipment being planned for material handling simplification, minimum lost cycle time and automated motions.

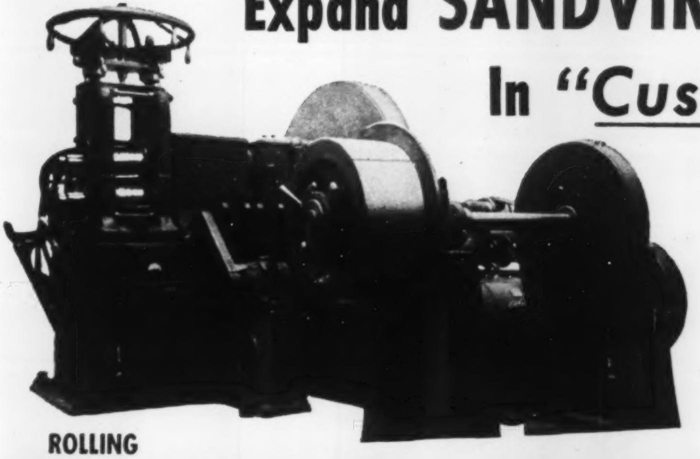
These complex operations call for closer control of hydraulic operating pressures, interlocking of electronic and electrical control with hydraulic power and the centralization of all control elements.

Mr. Otis . . .

Stimulated by the new federal road building program, the construction industry promises to keep producers on their toes for the next decade or more. Power transmission manufacturers see a marked trend toward the use of more compact and more efficient drives for road building and other machinery.

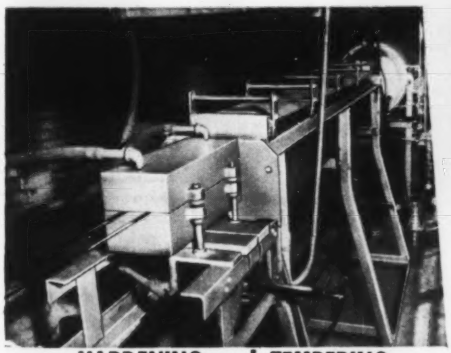
Achievements in industrial research have paved the way for meeting this demand. New standards for

New Fair Lawn Facilities Expand SANDVIK Service In "Custom-Tailoring"



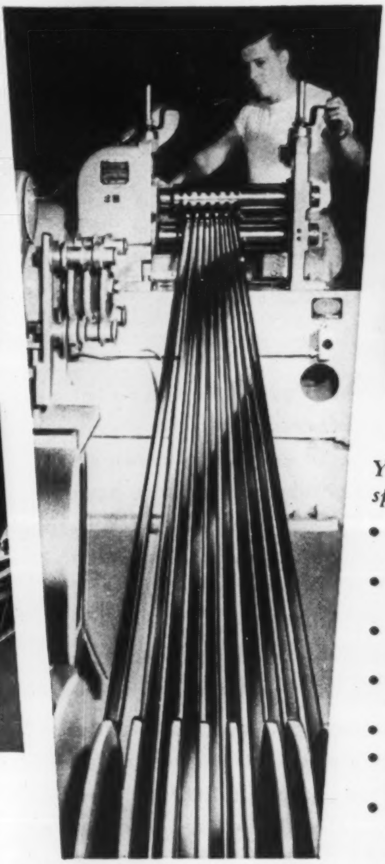
ROLLING

QUALITY SPRING STEELS



HARDENING and TEMPERING

EDGE FILING



QUALITY CONTROL

You can get Sandvik cold rolled specialty strip steels:

- In special analyses for specific applications.
- Precision-rolled in thicknesses to fit your requirements.
- In straight carbon and alloy grades.
- Annealed, unannealed or hardened and tempered.
- Polished bright, yellow or blue.
- With square, round or dressed edges.
- Wide range of sizes in stock — or slit to your specifications.

Ask your nearest Sandvik office for further information or technical assistance.

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Sandvik Quality Steels

SS-114

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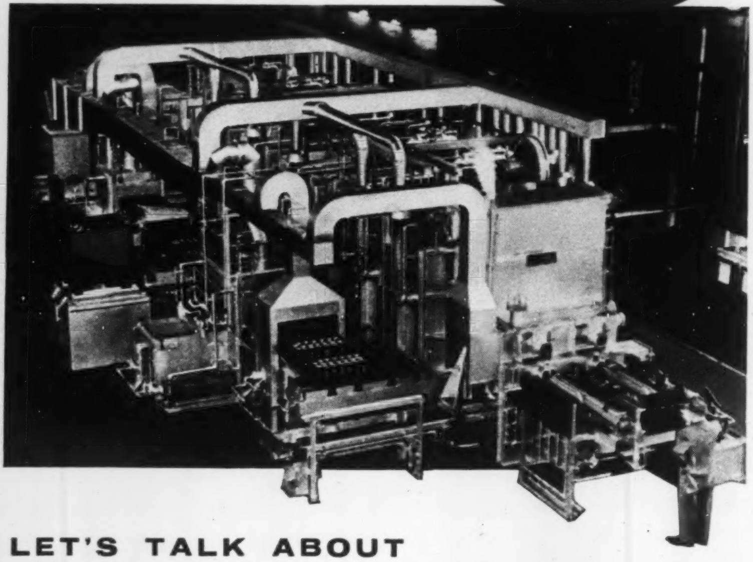


BLAZING THE HEAT TREAT TRAIL WITH HOLCROFT

LET'S TALK ABOUT

HEAT TREAT STANDARDS

When you take a long look at today's heat treat standards, you'll find that many of them were originated or perfected by Holcroft and Company.

For example, back in 1922 the removable electric heating element was developed. As far back as 1934, Holcroft recognized the significance and importance of equilibrium constants and their value to controlled atmosphere heat treating. And in 1945, was initiated the use of refractories and ceramics in place of scarce and expensive nickel-chrome alloys in vital parts of the furnace. These are only three of many, many innovations which have become heat treat standards in the industry.

Pioneering in the past—forward thinking for the future . . . that's what you get when you invest in a Holcroft heat treat installation. And that investment is returned in the form of higher quality control standards and lower heat treat costs. Better investigate—today!

HOLCROFT AND COMPANY

BUILT BY HOLCROFT & COMPANY DETROIT MICH

6545 EPWORTH BOULEVARD • DETROIT 10, MICHIGAN
PRODUCTION HEAT TREAT FURNACES FOR EVERY PURPOSE

CHICAGO, ILL. • CLEVELAND, OHIO • HARTFORD, CONN. • HOUSTON, TEXAS • LOS ANGELES, CALIF. • PHILA., PA.
CANADA: Walker Metal Products, Ltd., Windsor, Ontario

E. H. BROWNING
Manager, Metal Working Section, Industry Engineering Dept., Westinghouse Electric Corp., East Pittsburgh, Pa.

belts and sheaves, incorporating higher horsepower ratings, were published recently by the Engineering & Research Committee of the Multiple V-Belt Drive & Mechanical Power Transmission Association and the V-Tech Committee of the Rubber Manufacturers Association. These standards are typical of work being done by the two associations to keep industry abreast of progress in power transmission.

Another significant trend is toward more extensive use of shaftmounted speed reducers. More of this type will be used as component parts of machine tools. Horsepower of shaftmounted speed reducers is being increased. The maximum a year ago was 60 hp; new models offer an increase of about 50 per cent.

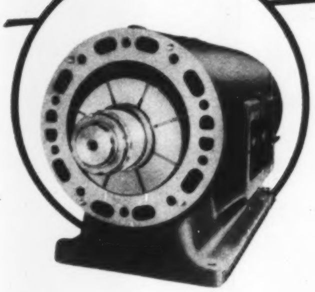
Widening acceptance of the tapered bushing as a method of fastening wheels to shafts is reported. This principle, proved practical for v-belt sheaves and single roller chain sprockets, is being applied to double strand sockets to drive heavier loads.

Mr. Browning . . .

This year will mark the advent of extensive use of punched card programming controls which permit automatic operation of hot strip mill reversing roughers, blooming and slabbing mills and plate mills. One large steel mill in the Pittsburgh area will start operating a 6000-hp reversing roughing mill under the automatic control of a punched card programming system.

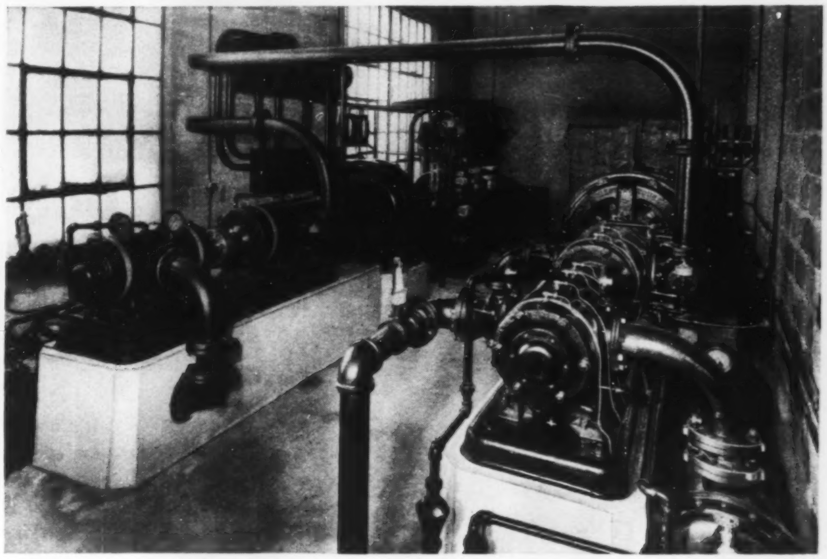
The roller will place a punch card into a card reader, press a pushbutton and the mill will make the proper number of passes at the correct speed and roll separation to process

Fuller *pioneered*



the two-stage rotary compressor • • • for general industrial use • • • starting in 1930

INSTALLED 1930
STILL GOING STRONG
Two Fuller Rotary Two-stage Compressors. Capacity each 740 c.f.m., 100-lb. pressure.



Fuller Company not only pioneered the rotary compressor for industrial use in this country, but it has always stressed the "spotting" of compressors. There's nothing new or startling about this principle . . . Fuller has advocated it ever since its first machines were put on the market in 1930 . . . applying each compressor to a specific job, with resultant overall plant economy, as well as power savings. Result: the adoption of this economical layout by thousands of users has proved to their satisfaction the soundness of such a program.

Fuller has built and sold thousands of Fuller Rotaries—a large proportion of the two-stage type. And, when plant expansion is necessary, with a consequent demand for more air, additional Fullers are naturally installed.

Fuller engineers have never rested on their oars, but have continually worked to improve design and efficiency, until today, these machines are second to none for dependable air-production in industry.

We welcome the opportunity to present to you all the facts concerning Fuller Rotary Compressors, facts built on actual operational experience. For a complete description of Fuller Rotaries, write for Bulletin C-5A.

VISIT OUR BOOTH 1664
PLANT MAINTENANCE SHOW
CLEVELAND JAN. 28-31

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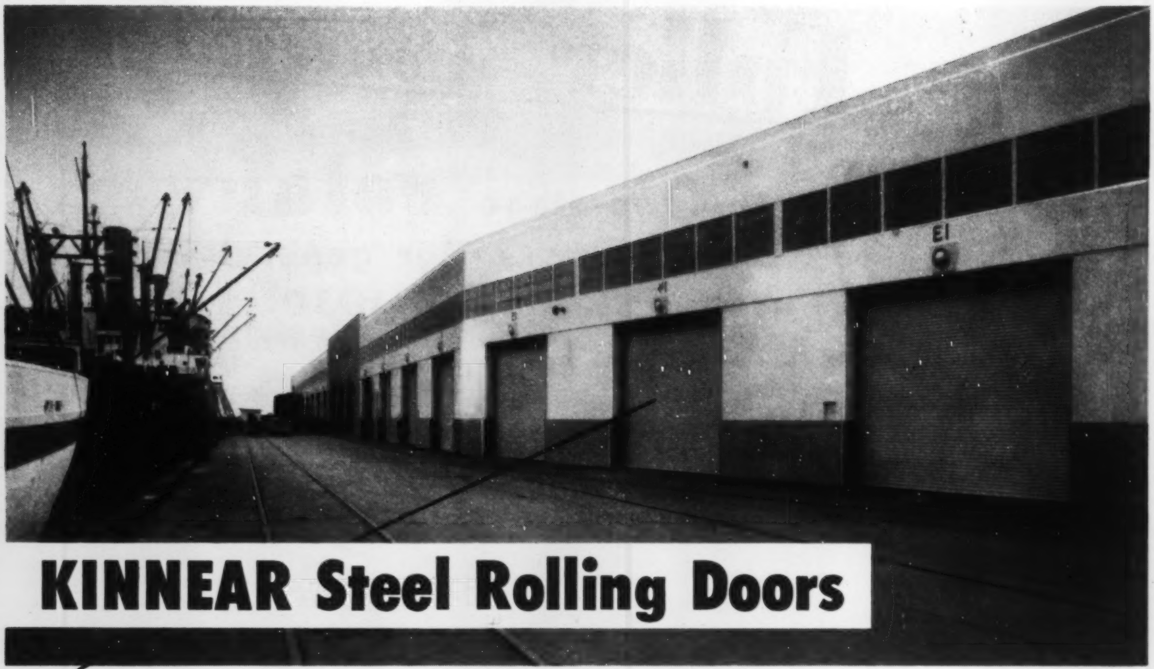
C-275
1783

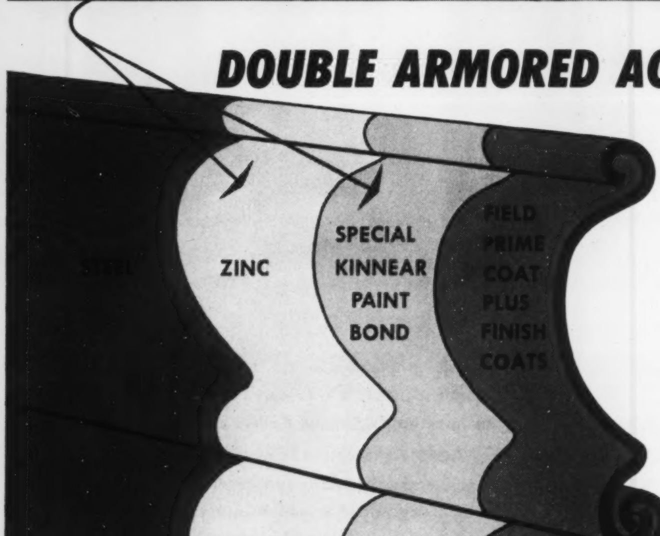
Fuller

PIONEERS OF HIGH-EFFICIENCY VANE TYPE ROTARY COMPRESSORS SINCE 1930



KINNEAR Steel Rolling Doors

DOUBLE ARMORED AGAINST THE ELEMENTS


STEEL
ZINC
SPECIAL KINNEAR PAINT BOND
FIELD PRIME COAT PLUS FINISH COATS

KINNEAR Steel Rolling Doors are protected by a heavy coating of zinc, (1.25 oz./sq. ft. as per ASTM standard) plus Kinnear Paint Bond (a special phosphate coating) which permits easy, thorough painting.

It's no wonder Kinnear Steel Rolling Doors are specified in thousands of pier installations where they are subject not only to normal weather conditions, but the highly corrosive action of salt spray, wind and heavy humidity. Kinnear Steel Rolling Doors are the obvious choice where maximum durability is a MUST. The interlocked slats that form the curtain of Kinnear Rolling Doors are double protected against the severest conditions of climate and weather by heavy galvanizing and a treatment of special Kinnear Paint Bond.

Kinnear's curtain of steel also provides the maximum protection against intrusion and vandalism. Deep guide channels and positive interlocking of slats provide a solid barrier against intrusion as well as the elements. And against fire, too. Kinnear's easy upward-coiling action also means no wasted space.

THE KINNEAR MANUFACTURING COMPANY

FACTORIES:
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SAVING WAYS in DOORWAYS

KINNEAR
ROLLING DOORS

C. R. WHITNEY JR.
Application Engineering Supervisor
Square D Co.
Milwaukee

the bar to finished size. Rolling schedule information relating pass number, mill screwdown position and mill speed for a given bar or group of bars will be punched on a business machine type card.

This information will be read into circuitry which makes extensive use of transistors. It will be digitally interpreted and utilized to position and control the various electric drives which power the mill and mill auxiliaries. Sensing systems using hot metal detectors and strain gages will function with the programming system and the basic adjustable voltage controllers to provide automatic slowdown and reversal of the mill.

A blooming mill soon to be installed in the Chicago area will use the same form of control. In addition, automatic programmed controls will be used to position manipulators and manipulator fingers.

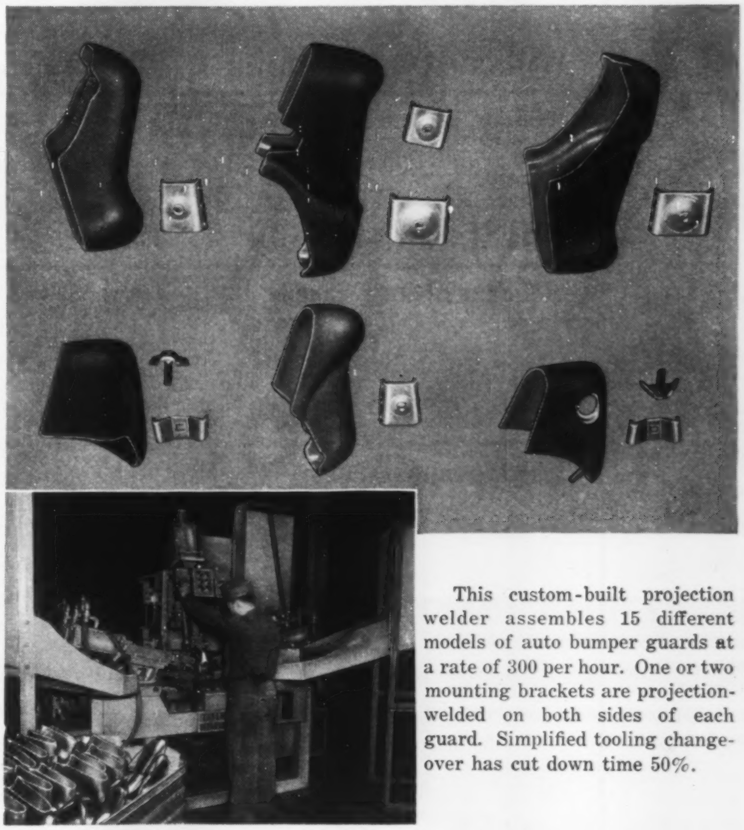
Directed at improving product quality as well as quantity, these new systems are being applied to govern operations which in the past have functioned largely under the direct influence of human judgment.

Mr. Whitney . . .

As automatic control systems become more complex, each component must be critically analyzed to insure that its life and reliability are compatible with the over-all system. The automatic control system is only as good as its weakest component. The importance of closer liaison between user, machine manufacturer and control manufacturer becomes greater.

It is significant that a great change is taking place in control system components. Electromechanical devices are undergoing redesign to make use of recently developed

1 specially-tooled T-W welder assembles 15 bumper guards



This custom-built projection welder assembles 15 different models of auto bumper guards at a rate of 300 per hour. One or two mounting brackets are projection-welded on both sides of each guard. Simplified tooling changeover has cut down time 50%.

Specially-designed resistance welders speed assembly of many products that are similar — yet different. Custom tooling provides the answer. Designed for rapid changeover, special tooling reduces down time and lowers unit cost. It also permits economical modification for producing redesigned models. The result is a savings in capital investment and operating costs. For information on reducing your assembly costs now — and year after year, call the nearest Taylor-Winfield office, listed below.

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131 Sidney Street, Cambridge 39 Massachusetts

BRINTON WELSER
Vice President
Chain Belt Co.
Milwaukee

materials which offer higher reliability and longer life in a smaller package. Input elements such as limit switches are now supplemented by static devices sensitive to the presence of metal without physical contact between transducer and work. Ignitron contactors, long used for resistance welder power switching, are being applied with great success to control huge direct drive presses. Low power level magnetic amplifiers are being applied as binary switching elements in special systems.

Mr. Welser . . .

The ever-increasing cost of labor is leading to intense mechanization of industry. Because of the increasing and distinctive means of mechanical power transmission becoming available—each suited to specific areas of loading and controlling—the field of application is continually widening.

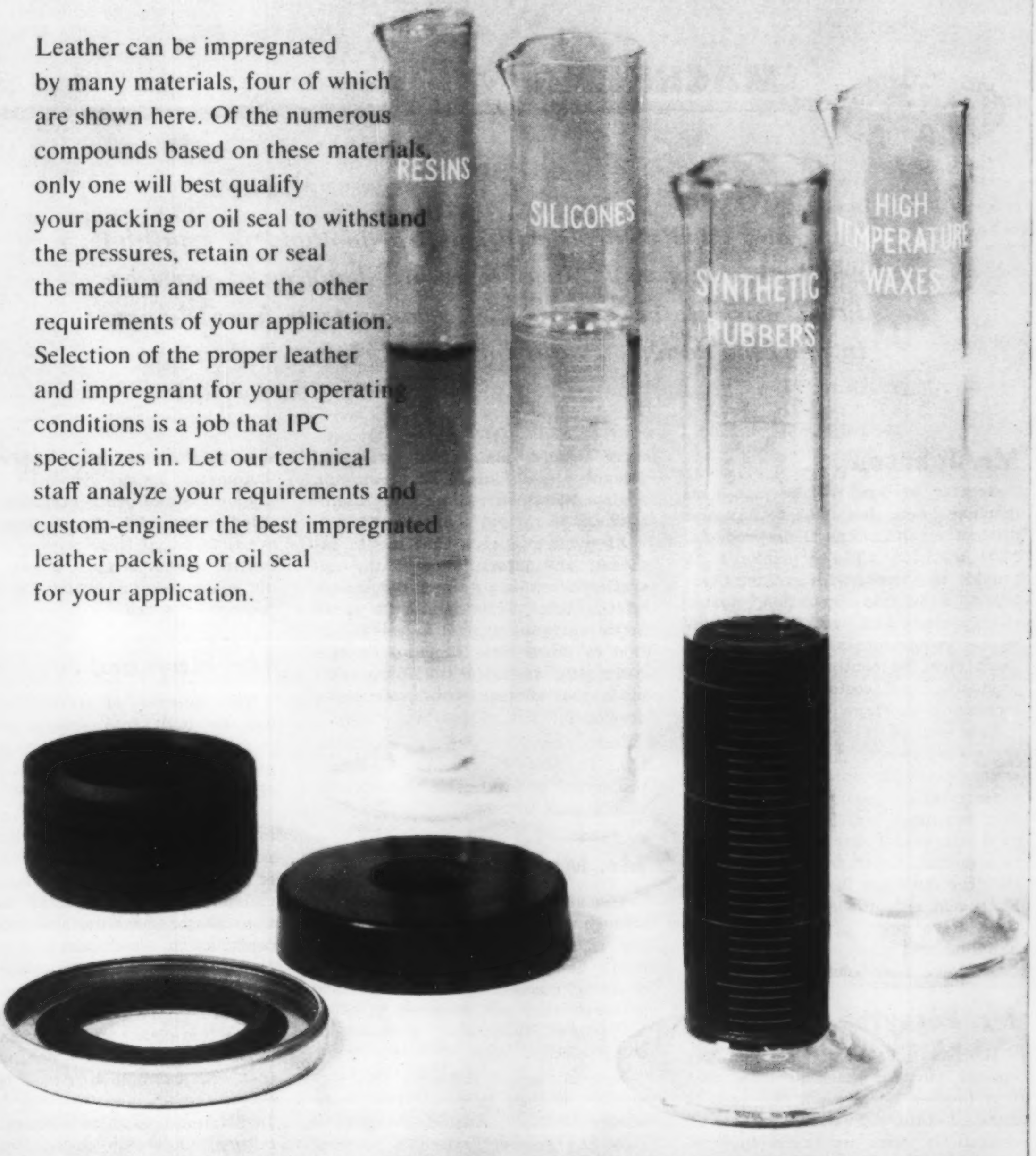
Sprocket chains, with their broad range of styles and sizes, their positive action compactness, flexibility and ease of adaptation, constitute a major proportion of mechanical power transmission. Improved manufacturing techniques, plus advances in design, have produced a better product enabling chains to carry greater loads and move at higher speeds. They are opening new avenues of application.

Other equipment used in mechanical power transmission, such as antifriction bearings, also has been undergoing improvement. With increased precision and greater bearing capacity for both thrust and radial loads, and an accompanying lessening of noise, there is corresponding prolonging of production accuracy for the equipment in which such bearings are used.

IPC

All Leather Impregnations . . . but *all different*

Leather can be impregnated by many materials, four of which are shown here. Of the numerous compounds based on these materials, only one will best qualify your packing or oil seal to withstand the pressures, retain or seal the medium and meet the other requirements of your application. Selection of the proper leather and impregnant for your operating conditions is a job that IPC specializes in. Let our technical staff analyze your requirements and custom-engineer the best impregnated leather packing or oil seal for your application.



INTERNATIONAL PACKINGS CORPORATION

Bristol, New Hampshire

P1

GEORGE H. JOHNSON
President, Gisholt Machine Co.
Madison, Wis.

N. M. FORSYTHE
Vice President & General Manager
National Automatic Tool Co. Inc.
Richmond, Ind.

ALAN MATTISON
President, Mattison Machine Works
Rockford, Ill.

HOWARD N. MAYNARD
President, Snyder Tool & Engineering
Co., Detroit

MACHINING

FORUM ON TECHNICAL PROGRESS

Tape and card controls will get firm foothold in small-lot production shops . . . in automation, banking of parts between work stations grows . . . ceramic tools force changes in machine design . . . automatic tool change is coming . . .

Mr. Johnson . . .

Greater burdens will be placed on machine tool builders to expand production and refine their products. New methods will be explored to provide equipment with greater flexibility, simplified operation, faster change-over and reduced maintenance requirements. This development must be continued to increase production, cut costs and offset the increasing shortage of skilled labor.

New equipment must be developed to solve specific problems. For example, we are now manufacturing a center drive tracing lathe. It contour machines both sides of jet engine compressor discs simultaneously to a minimum web thickness of 0.010 in. The discs are 28 in. in diameter. Extensive reductions in floor-to-floor time have been achieved. Extra handling and many secondary operations have been eliminated.

Mr. Forsythe . . .

We see a growing demand for special purpose machine tools that will process parts from the raw to finished state. They will include all operations, such as machining, inspecting and assembling.

This trend toward more complicated machines requires intricate but more easily maintained electrical controls and improved hydraulic equipment which requires less maintenance.

As cutting speeds continue to increase, any interruption of the operation becomes a greater percentage of the total cycle time. So more attention is being paid to the reduction of down time for tool change. Automatic methods that may outmode tool control boards are being developed.

Index time is getting attention, too. It also represents a larger proportion of total cycle time as cutting speeds increase.

Mr. Mattison . . .

The ability of surface grinders to remove metal has been an eye opening experience for many production men. Some had thought of them as finishing machines. Modern surface grinders, they are discovering, often outperform traditional methods of doing certain jobs.

Several factors influence this significant change in production technology. They include improved rigidity, greater strength, higher spindle horsepower and improvements in grinding wheels.

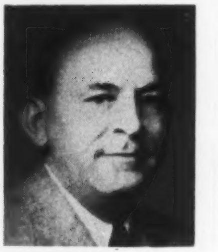
Some recent improvements are sure to stimulate more applications. Automatic sizing systems increase production and control quality of finished parts. Of utmost importance is the fact that these gaging systems control quality while the part is being machined, preventing the manufacture of scrap.

Mr. Maynard . . .

The amount of versatility that can be built into special machine tools with automation is directly proportional to the initial engineering effort put into the designs.

It is difficult to build versatility into an in-line transfer machine economically because of the high cost of tool changes involved. Even with machines using segmented automation, major benefits are simplified construction, easier maintenance and more flexibility for the adaption to different parts.

Most flexibility is required in lower production plants where several parts must be processed on one machine tool. An example is a two-way precision boring machine that handles 19 different transmission cases. Flexibility and minimum change time were provided by belt-change spindle speed adjustment, movable boring heads, tool setting gages and a magnetic



G. M. STICKELL
Vice President & General Manager
Landis Machine Co., Waynesboro, Pa

KIRKE W. CONNOR
President, Micromatic Hone Corp.
Detroit

WALTER S. PRAEG
President, National Broach & Machine
Co., Detroit

EVERETT M. HICKS
Vice President, Grinding Machine Div.
Norton Co., Worcester, Mass.

workholding fixture.

In planning for maximum economy, in high production schedules, too much built-on flexibility may not be worth the extra cost of engineering and construction. But flexibility in lower production requirements for a variety of parts may be the only economic justification for the machine.

Mr. Stickell . . .

Thread rolling is highly productive, accurate to a degree and imparts a surface finish difficult to obtain by any other method.

An added advantage is the ease with which thread rolling machines can be adapted to burnishing and serration rolling and, to a lesser extent, to the rolling of splines and gears.

What is overlooked in comparing thread rolling to thread cutting or thread grinding is that there are more limitations to thread rolling than to either of the other processes. Thread rolling requires material with good flow characteristics. It also requires precise control of the size of workpieces if accurate full thread size is to be maintained. Finally, if maximum benefits are to be obtained, the designs of the thread and workpiece must lend themselves to cold forming.

Mr. Connor . . .

Two factors that will continue to influence the development of new honing equipment: The trend to more automatic operation and the need for more accurate, functional surfaces on an ever-widening variety of workpieces.

Honing is easily adapted to automatic processing. Accuracy does not depend on the skill of an operator, but is the result of basic principles used in the process. The abrasives are self-sharpening, and the tool and part automatically align themselves.

As new designs increase the speeds, pressures and loads carried by components in all types of engines and controls, the need for greater precision and truly functional surface finishes becomes more acute. There has been a growing demand for equipment to do a variety of jobs including: The honing of flat surfaces that must form a tight seal without gaskets; honing accurate spherical surfaces on rod ends and ball studs that must move freely under severe conditions; honing torus-shaped surfaces in the ball grooves of antifriction bores; honing long tubing to close tolerances; and honing small, precise outside diameter and inside diameter surfaces on valves and fuel injectors.

Mr. Praeg . . .

Development of a new hard gear finishing process, gear tooth honing, can be expected to set high quality standards. Gears so produced are quieter because of the removal of nicks and burrs, correction of small heat-treatment tooth errors and the improvement of tooth finish.

Continuing development work is being carried out to determine how much tooth correction can be done economically with the honing process.

Automatic sound testing with electronic-ear devices makes inspection more nearly foolproof. Electric circuits that link sound and reject devices have been redesigned. New control devices have been added to assure that only sustained gear noise will cause rejection.

The extension of new automation concepts to internal rotary gear shaving is another significant cost cutting development. Fully automatic loaders are in operation on internal gear shavers. Working from a magazine feed, these mechanisms load the gear in mesh with the cutter, advance it to the shaving position and unload it after the operation is completed.

Mr. Hicks . . .

New power units and transmissions being developed for automobiles will require changes in conventional machining practices. New gas turbine and free piston engines will almost certainly use new materials and new production techniques. While most of these products are still in development stages, machine tool builders may be called on to meet the challenge in the comparatively near future. In fact, the success of these power units may hinge on the satisfactory solution of these production problems.

The drive for increasing productivity continues to tax the ingenuity of the machinery builder who must provide automatic operation at reasonable cost. Extension of the building block principle of unitized design can be expected as users insist on greater flexibility and longer life of automatic machines.

We also expect increasing requests from machine tool users for more

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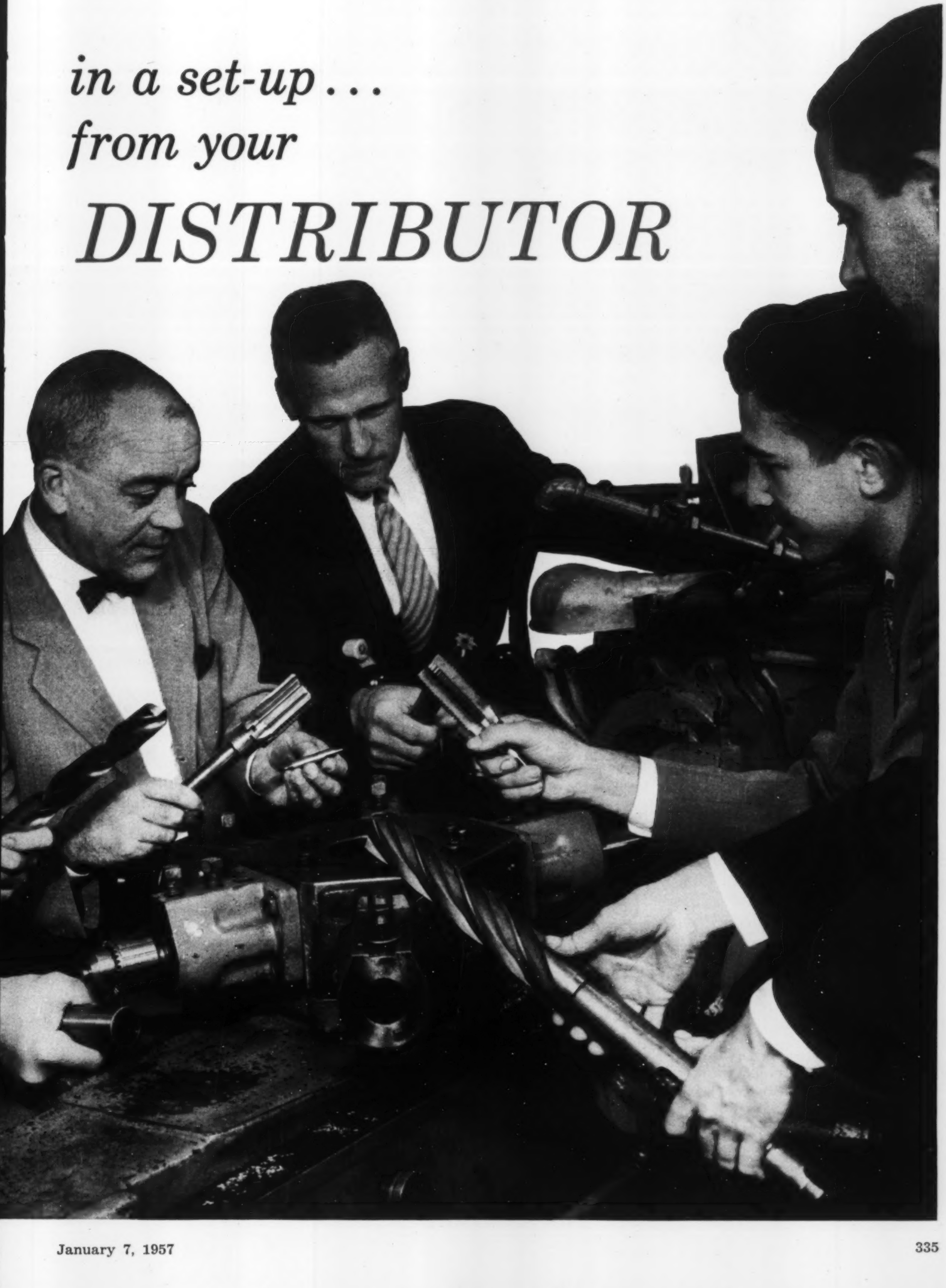

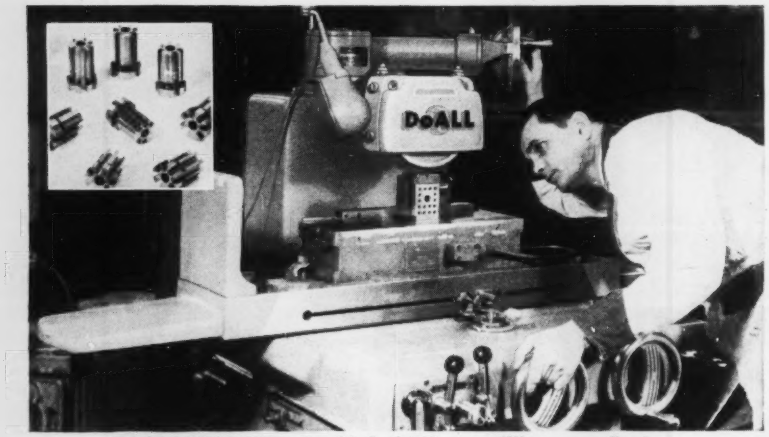

TOOLS LIKE THIS give birth to TV sets millions can afford . . .

THE FACTS
OF the better LIFE

THE TRUTH is the stork doesn't bring television sets . . . or any of the other material benefits of modern living.

They are born in factories, mothered and fathered by tools. The more and better the tools, the more and better their offspring—freezers, food and fishing tackle . . . cameras, cashmeres and canoes. This is the stuff good living is made of. And tools are its only source.

The birth of a TV set illustrates the principle. Machines that produce plastic sockets for the vacuum tubes require dies of extreme precision. But the cost of grinding the dies was exorbitant—until a machine employing the "Cool-Grinding" principle was employed. Now a die manufacturer produces more in two days than he formerly did in five. And the grinding wheels last four times as long. This is one of the reasons TV sets are priced within the reach of millions of people.

It takes a lot of tools to supply a growing abundance of goods and services for a growing population. Every year at least 40 billion dollars must be saved and invested for this purpose—because the stork doesn't bring the tools, either. It takes 25 billion dollars just to maintain existing tools. Another 15 billion is needed to add to the tool supply—5 billion to provide 400,000 new jobs per year and 10 billion to increase productivity per employee a conservative 1½% per year.

These are the facts of the better life everybody seeks. To secure it, business management must daringly plan ahead—labor must use the tools efficiently—and Government must provide a favorable tax climate. Otherwise, the tools won't be there in the quantities needed.

The cost of the dies used in making plastic sockets for TV sets was slashed by DoALL "Cool-Grinding"—a patented process wherein coolant flows through the grinding wheel and out at point of contact with the work. Faster grinding, greater accuracy, smoother finish, greater visibility and longer wheel life are secured.

Reprints of this series on economics available for your employees.

FREE FILMS—sound, color films "Techniques of Surface Grinding" and "Extending the Range of Modern Surface Grinding" are available for group showings. Address requests on company or school letterheads.

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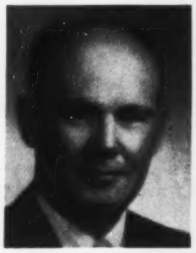


RALPH J. KRAUT
President, Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.

MARVIN R. ANDERSON
President, Michigan Tool Co.
Detroit

complete final testing at the builder's plant, to determine machine capability for rate of production, dimensional tolerances and required finishes.

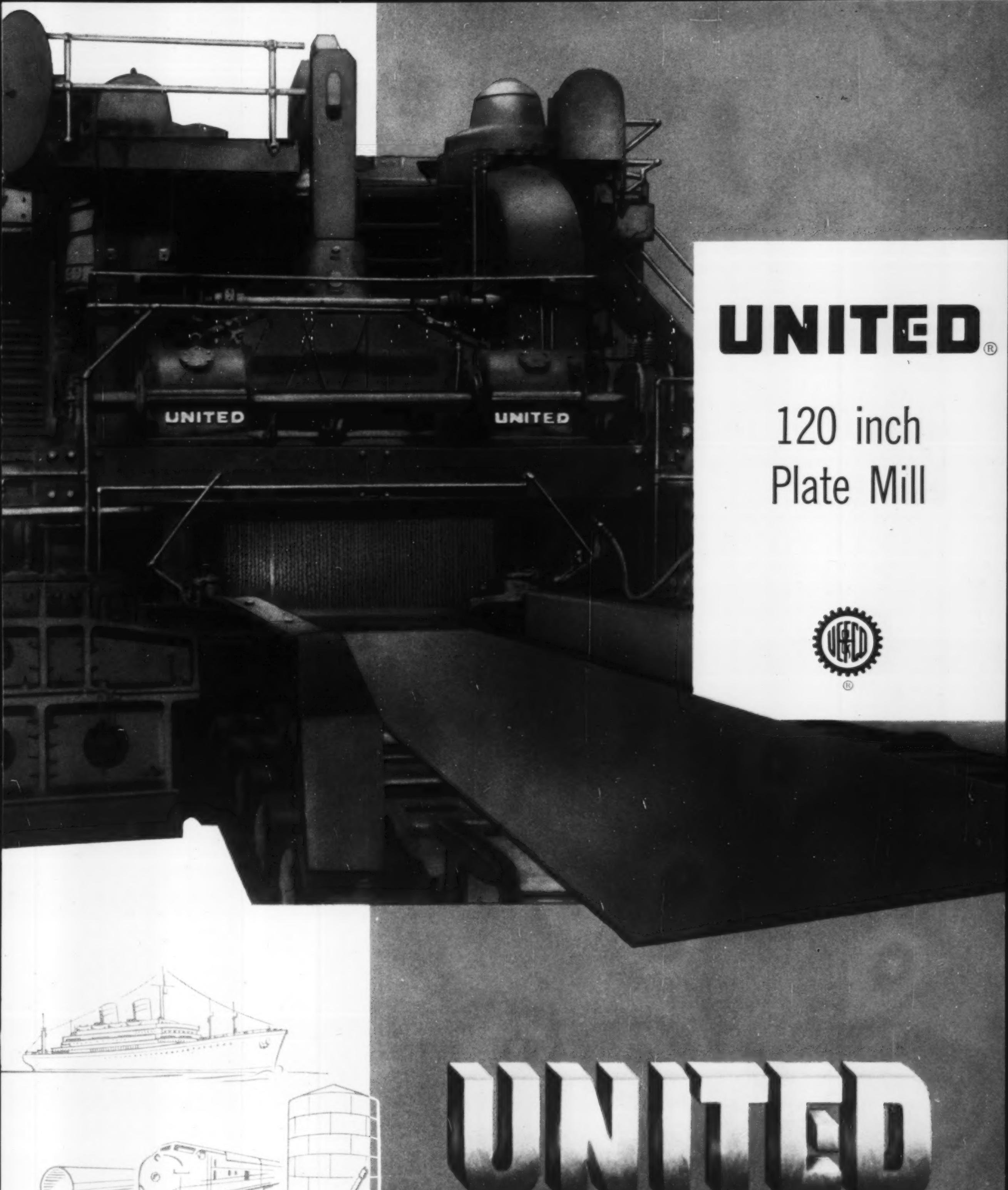
Mr. Kraut . . .

During 1956, orders and specifications were placed for 50 to 100 machine units, which operate automatically under tape control.

The tape control idea is being studied enthusiastically by aircraft builders, the die sinking industry and the small quantity production shops which produce difficult machine work. In 1957, many machine units with tape control will be delivered to airframe builders. A tremendous effort to train engineering and shop personnel in their use will be started. Programs will center on the numerical analysis of cutter paths. Electronic computers will be among the devices used.

Mr. Anderson . . .

Machine tools with simpler controls and increased ruggedness for maintenance-free full-time operation will continue to be a basic requirement of automation. Machine tool design effort will be pointed toward



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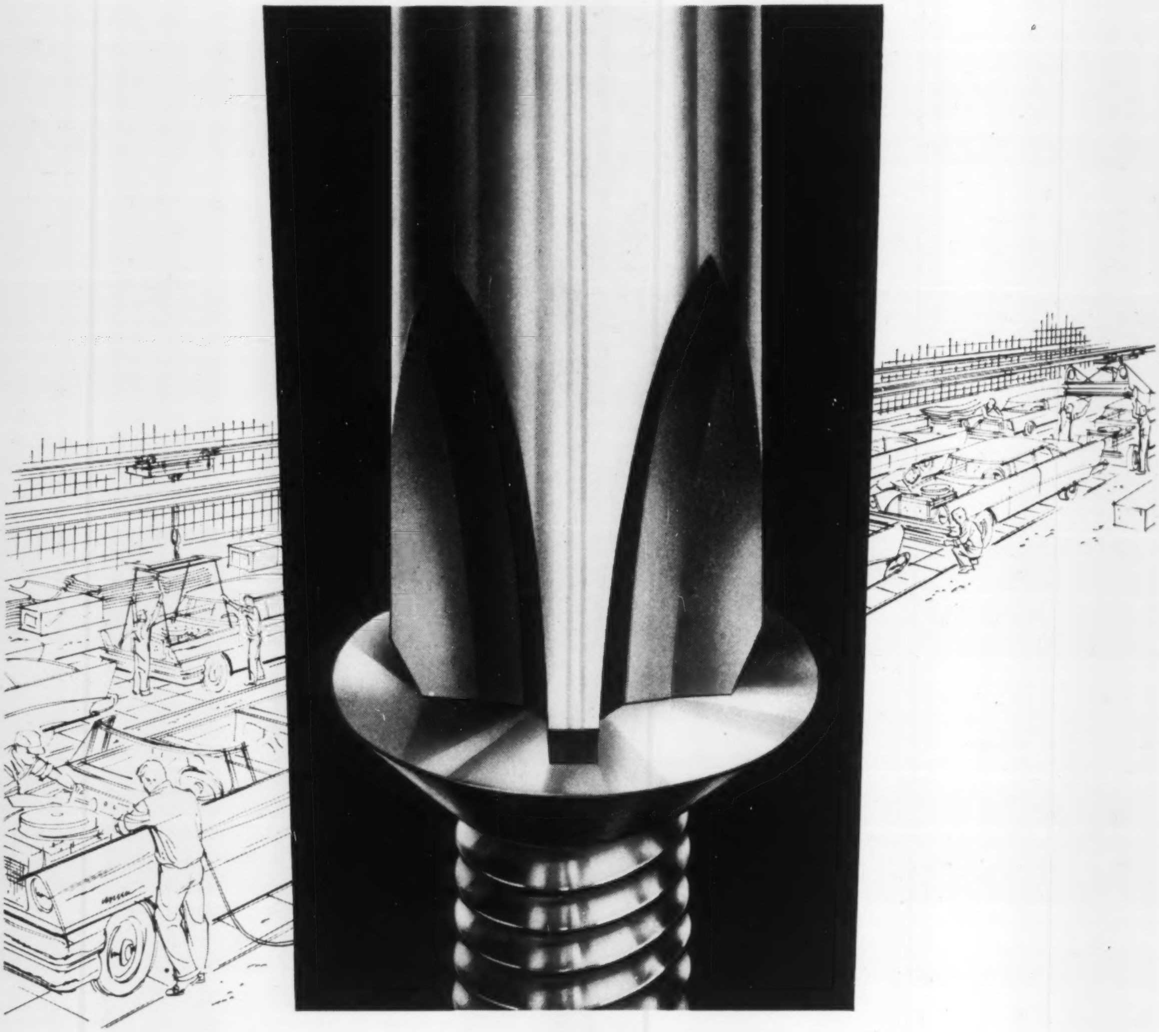

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Fastening costs are usually composed of four factors: price, service, quality and research.

Prices will sometimes vary under local circumstances, but nowhere will you get more of all four than from American.

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In service, where American's clockwork delivery meets any production demand . . . from single-case to precision-scheduling of carload lots.

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L. V. COLWELL
College of Engineering, University of Michigan, Ann Arbor, Mich.

greater rigidity and strengthened construction, as well as higher speeds and feeds for optimum machining efficiency—particularly with the new cutting tool materials.

One of the latest trends in process metalworking is the displacement rather than the removal of metal. Such cold-forming operations eliminate wasteful production of chips, reduce costs and make for a better product. Development work in this respect is intensive and it is likely that in the near future gear rolling machines will be used as extensively as gear cutters are today. Equally important will be a continuing emphasis on automatic material handling through the loading, unloading and inspection cycles.

Mr. Colwell . . .

The speed of automation continues to be the most significant general development in the machining area. But there appears to be some leveling off of interest and planning in this area because it has been demonstrated that the high ratio of capital to labor costs requires a steady minimum market for the products of automation. This raises some question as to the nature and extent of additional automation in automotive and similar fields.

The machine tool industry is continuing exploration and development of the application of automatic programming for machining operations. There is a tremendous potential for applications of this type, but it is not clear just how the necessary machining information will be obtained and used for control purposes. In all instances, size and surface must be controlled. Equally important is cost. It is theoretically

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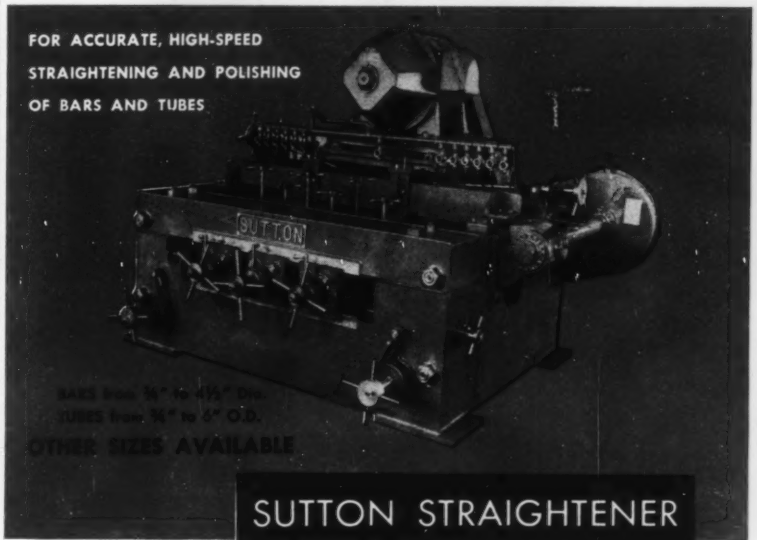

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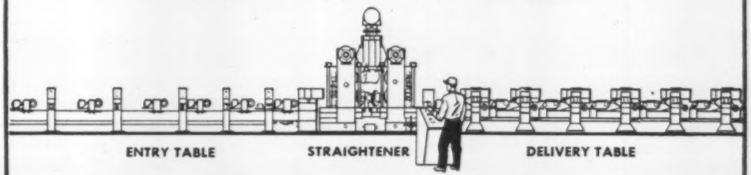

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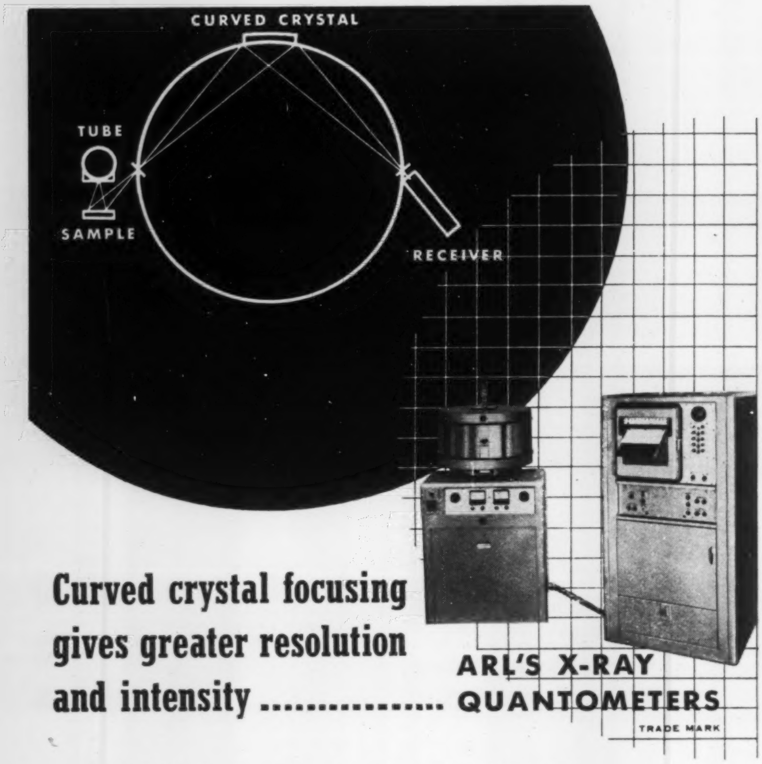

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JEROME A. RATERMAN
President, Monarch Machine Tool Co.
Sidney, O.

possible for automatic programming equipment to adjust variables contributing to cost and reduce them to a minimum. While this is theoretically possible, it is not yet feasible since so little is known about the nature of metal cutting and its relationship to economic factors. Considerable research and development can be expected in this area.

Mr. Raterman . . .

Ceramic tooling appears destined to become an important factor in determining the direction of future machine tool design.

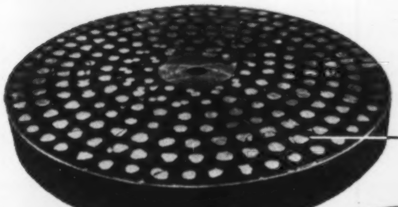
Experience indicates the necessity for changes in the design of machine tools before ceramics can be used with maximum effectiveness. With ceramics, cutting speeds and feeds are more critical than they are with carbides. Vibration also becomes a more serious factor.

The application of ceramics to tooling and the development of new machines to make the most of their special characteristics will take time. We cannot expect to obtain overnight the greater productivity of which these new tooling materials are capable.

Educating the design engineer and machine operator to use ceramics properly is high on the list of activities to be pursued this year. Such a program promises substantial rewards, especially if you know how far most shops are from getting full performance from carbide tooling.

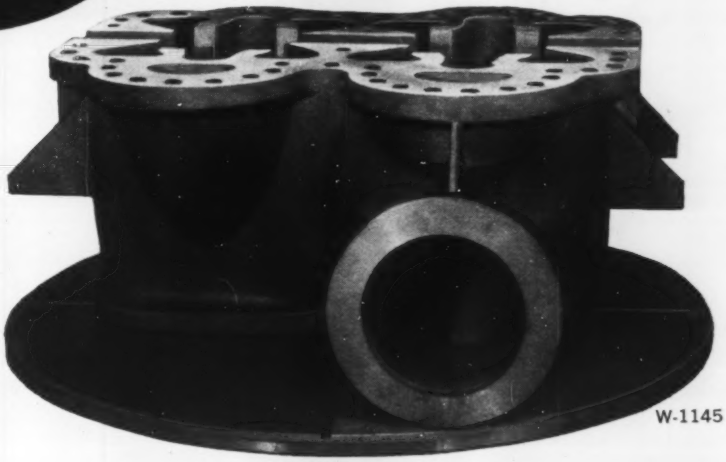
Our research indicates that average cutting speeds are still more than 40 per cent below those which are feasible.

Thus, continued efforts will be directed this year toward improving



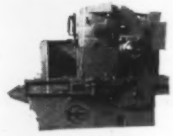
W-1143

tiny or **tremendous**...

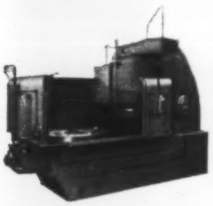


W-1145

For best results... *PUT IT ON A BLANCHARD!*



Blanchard No. 18



Blanchard No. 42-84

There's a Blanchard for every surface grinding job, in a broad range of sizes. For example, the Blanchard No. 18 grinds non-magnetic transistor elements (upper left) .006" thick, to a tolerance of .0005" with good finish. This job, which involved .006" to .008" stock removal per side, was held on special fixture plates.

At the other end of the scale, a huge Blanchard No. 42-84 Grinder grinds a turbine housing (upper right) which measures 83" across the corners, and is 28" high. This housing, ground after rough machining, required .020" stock removal. Both this piece and its mating part were ground to a steam-tight joint.

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President, Brown & Sharpe Mfg. Co.
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President & Treasurer
Cone Automatic Machine Co. Inc.
Windsor, Vt.

the metal removal capacity of new machine tools. We also must maintain flexibility, short setup time and low tooling cost.

Mr. Sharpe . . .

If the replacement of one machine tool can bring rich dividends. simultaneous replacement of many offers even more attractive possibilities.

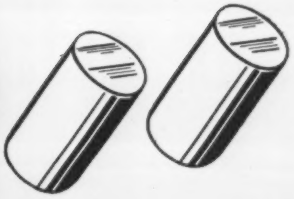
A "major surgery" replacement job provides much more than higher feeds and speeds. It brings savings by promoting improved work flow, lower inventory levels, up-to-date time study standards and the use of lower cost materials.

Such major surgery may even force you to redesign your product to take advantage of new production techniques. This is no drawback; it may be a blessing in disguise and generate new customer acceptance for a finer, simpler product.

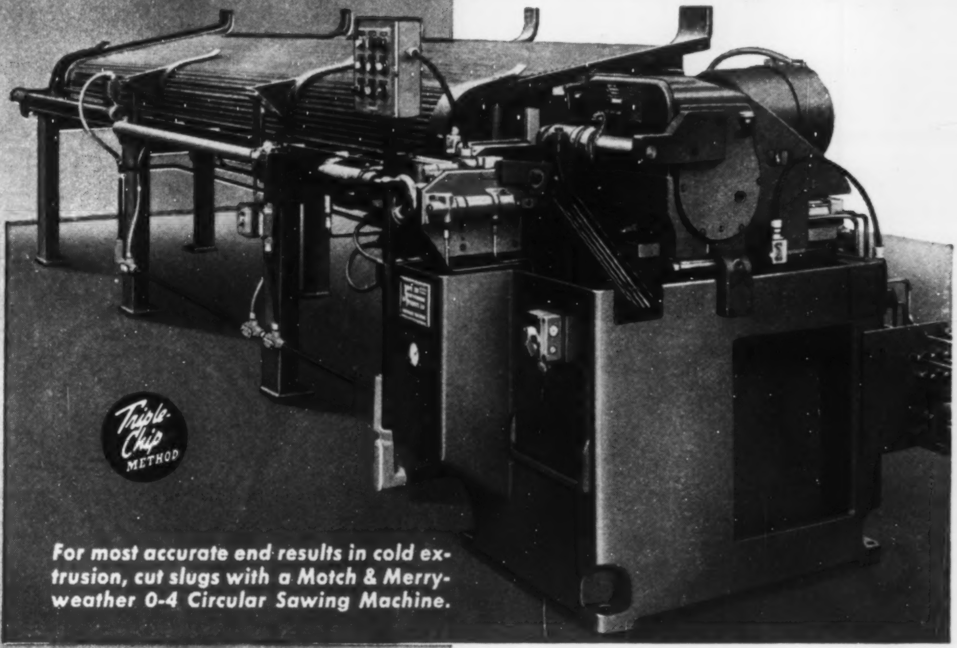
Mr. Chaplin . . .

With the wide range of work available, and more suggested for the future, the builder of multiple spindle bar automatics must face an increased investment in a greater number of models which are de-

cold cuts



BY MOTCH & MERRYWEATHER



For most accurate end results in cold extrusion, cut slugs with a Motch & Merryweather 0-4 Circular Sawing Machine.

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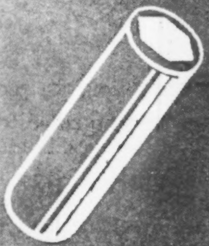

The Motch & Merryweather No. 0-4 Precision Circular Sawing Machine is automatic from the storage table to the finished cut slug. It cuts slugs accurate to ±.002" with uniformly square ends and minimum burr. Give your cold extrusion press the opportunity of producing more work than ever before, with more accuracy than ever before, at a lower cost per piece than ever before.

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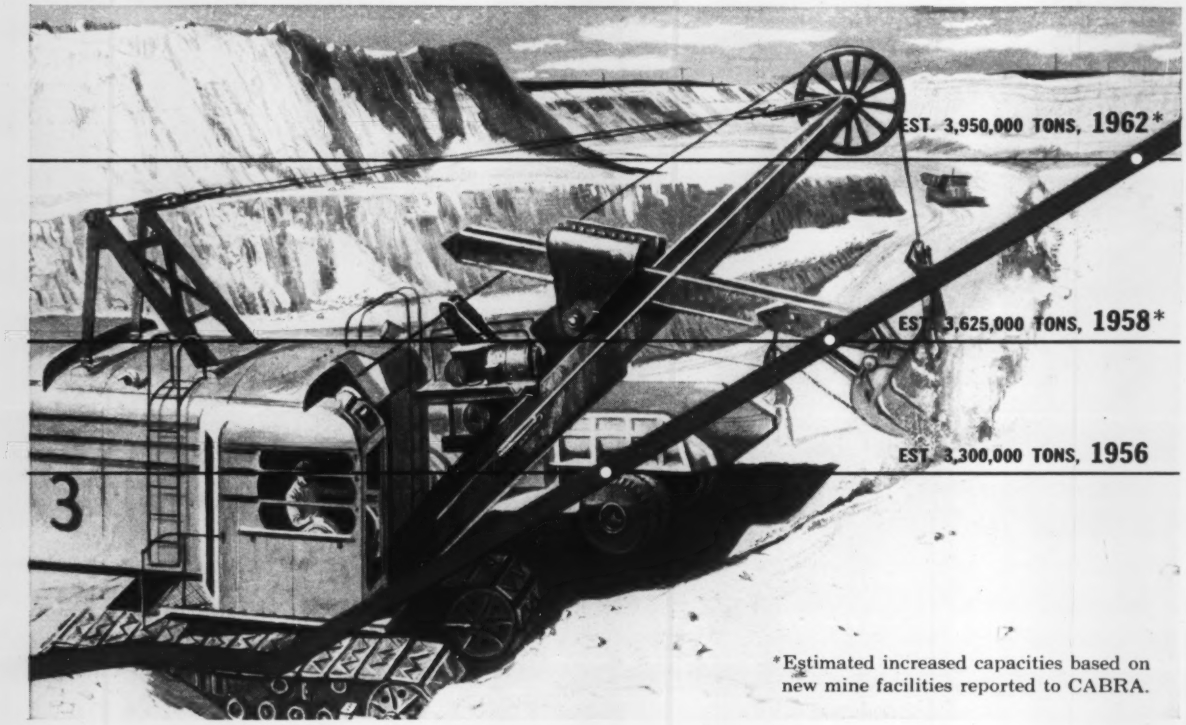
EST. 3,950,000 TONS, 1962*
EST. 3,625,000 TONS, 1958*
EST. 3,300,000 TONS, 1956
3

*Estimated increased capacities based on new mine facilities reported to CABRA.

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This question concerns many a Company whose future depends on quality of materials used today.

The Copper Industry gives this assurance:

> "Already, enough Copper has been made available to meet any normal requirement. And more is scheduled to come. Increased capacity . . . careful planning throughout the Industry . . . these factors will help to meet the expected increase in demand for Copper."

When *your* Company executives are meeting on the subject of *Copper,* suggest that they consider all of Copper's contributions to product-quality.

Remind them that no substitute offers Copper's combination of advantages. Some of them:

Copper conducts electricity best . . . lends itself to miniaturization . . . won't rust and resists corrosion . . . is an excellent heat transfer agent . . . forms and joins easily.

And lives . . . and lasts . . . and serves . . . and satisfies for more years!

So, before your Company meeting adjourns, move that this policy be adopted: "Progress is important to us . . . and Copper is important to our Progress!"

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H. G. BIXBY
President, Ex-Cell-O Corp.
Detroit

signed to excel in various segments of the total range. His alternative: Be satisfied to adopt a policy of service limited to part of the user's total requirements.

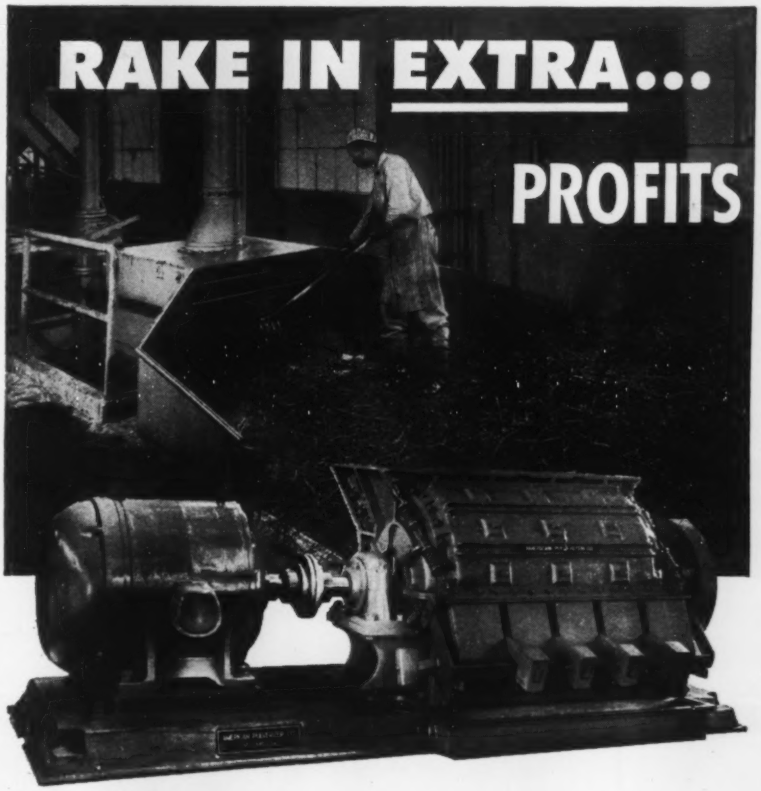
There is much to be said in favor of broader service to the user from the standpoint of maintaining leadership, or even identity. Concentrated production of only a few models, in an era of economic growth and maximum use of the machine, is the more streamlined route to immediate gains. Service to the user which is too restricted can result in too few orders from him tomorrow.

Mr. Bixby . . .

What is the machine tool industry doing to improve automation? The problem is being attacked from many angles, and progress is being made. Here are three avenues along which we are moving:

Service problems at one station need not hold up operations at other stations. Efficient storage and distribution units between machining stations permit a station to operate for as much as an 8-hour shift without receiving parts from a preceding machine or delivering them to a following station.

The role of gaging in automation is becoming more clearly defined. Tools working soft metals can cut for hours, even a complete shift, without requiring adjustment or change. Automatic gaging after such operations would be a needless luxury. Properly applied, automatic gaging insures the accuracy of critical operations by controlling tool adjustment and by stopping the operation if tools fail. These advances



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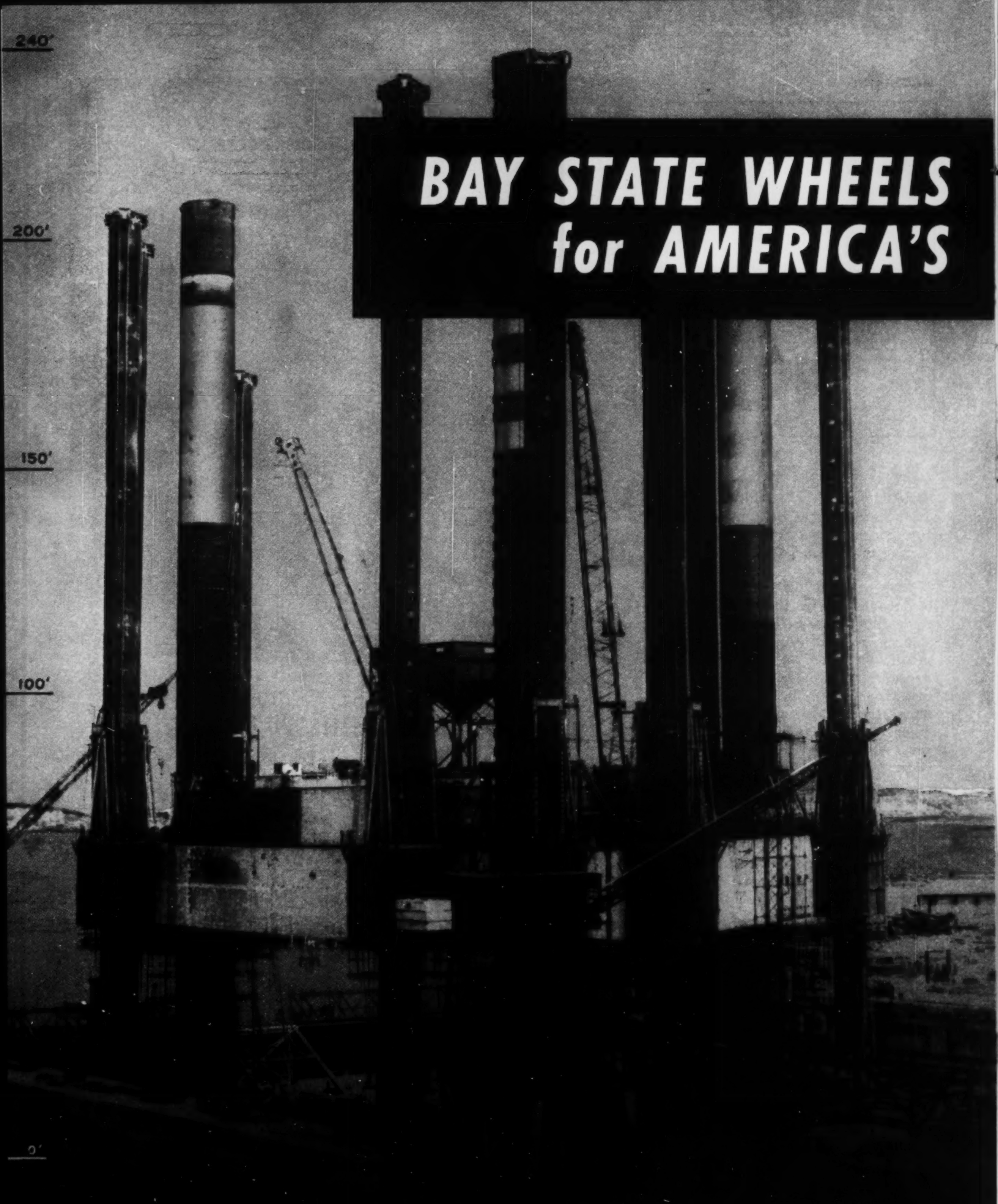

BAY STATE WHEELS
for AMERICA'S
240'
200'
150'
100'
0'

Texas Tower #3 shown during fabrication, courtesy of Continental Copper & Steel Industries, Inc., Walsh Holyoke, Portland Maine Division, builders. Sustaining hollow columns 240 feet high and 14 feet in diameter are of all-weld construction.

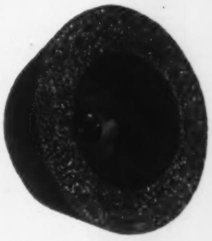
GRIND X-RAY QUALITY WELDS
TEXAS TOWER # 3

Welding was a primary factor in this construction and Bay State Abrasive wheels were used for the mandatory grinding of X-Ray quality welded joints.

This 6,200-Ton island of steel, now solidly rooted to the ocean's floor, was built to meet the North Atlantic's full force. No wonder that Walsh Holyoke demanded clean, uncontaminated welding surfaces for each critical joint . . . *and* the grinding wheels which could do this most efficiently!

These were *BAY STATE* wheels, which can do the same for you. Get the details from your local *BAY STATE DISTRIBUTOR.*

BLUE FLASH
Specification A-24R-BF2 used for grinding straight welds, corners, angles, and deep joints.



FLARING CUPS
Specification 3A-16Q4-BA2 used for heavy snagging of wide welds, and surface preparation on broad areas.

BAY STATE ®
WHEELS of PROGRESS

BAY STATE ABRASIVE PRODUCTS CO., Westboro, Massachusetts, U. S. A.
Branch Offices and Warehouses: Bristol, Conn., Chicago, Ill., Cleveland, Ohio, Detroit, Mich., Pittsburgh, Pa.
Distributors — All principal cities
In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

WHY MONARCH lathe head stocks are MICROHONED

Monarch Machine Tool Company Microhones the spindle bores in its lathe head stocks because Microhoning . . . generates consistent finish, size, and alignment of bores . . . corrects out-of-roundness . . . eliminates cost of line-reaming operations . . . permits interchangeability of spindles and bearings.

And with the use of a new three-diameter Microhoning tool, honing time is reduced approximately 40% over former method which employed two double-diameter tools. One set-up now replaces multiple set-ups previously required.

APPLICATION DATA:

STOCK REMOVAL
.003" to .004"

TOLERANCES
diameter........ .0002"
roundness....... .0001"
taper........... .0001"

FINISH....20-25 microinches

PREVIOUS OPERATION
line boring

3 IN-LINE BORE SIZES
4.125" dia. x 1.500" long
5.118" dia. x 1.250" long
6.299" dia. x 5.125" long

Micromatic tooling for Microhoning applications is constantly furnishing manufacturers with cost reductions, higher production and better functional characteristics. A Micromatic Field Engineer will be glad to discuss your production problems and show you "Why" the proper Microhoning tools will help.

The principles and applications of Microhoning are explained in a 30-minute, 16 mm, sound movie, "Progress in Precision" . . . available at your request.

☐ Please send me "Progress in Precision" in time for showing on________________(date).
☐ Please have a Micromatic Field Engineer call.
☐ Please send Microhoning literature and case histories.

PRECISION PRODUCTION THROUGH MICROHONING
MICRO MATIC

NAME____________________
TITLE____________________
COMPANY____________________
STREET____________________
CITY__________ZONE______STATE________ C

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

E. C. BULLARD
President & General Manager
Bullard Co., Bridgeport, Conn.

J. P. CROSBY
Vice President-Sales
Lapointe Machine Tool Co.
Hudson, Mass.

indicate automation's direction. More and more small firms will become interested in it.

Mr. Bullard . . .

Forecasts for the metalworking industry show that dollar volume is expected to gain more than a third by 1960. By 1970, it should more than double the 1955 record of $128 billion.

To meet this expanding requirement, tomorrow's factories will have to produce more goods per square foot of floor space through the use of more efficient equipment and machine tools.

The machine tool industry will meet this challenge by building machines that will take advantage of the new cutting tools, higher feeds and speeds, centralized controls and automatic positioning of work. Production will be increased. Costs will be reduced.

Mr. Crosby . . .

Machining the latest developed alloys for the jet industry calls for a broaching machine with an extra long stroke. The electromechanical drive lends itself to these machines. We have already reached a stroke of

ARVID LUNDELL
President, Colonial Broach & Machine Co., Detroit

H. H. WHITMORE
Vice President & General Manager
Jones & Lamson Machine Co.
Springfield, Vt.

240 in., and still longer ones are contemplated.

The horizontal three-point bearing slide assures a constant and accurate cutting surface. The ingenuity demanded by the self-feeding mechanism is apparent in the broaching fixtures that are particularly suited to these electromechanical drive machines.

Mr. Lundell . . .

No machining process is undergoing a more radical redevelopment than broaching. As proof, we need only point to the re-emergence of mechanical broaching with electrically operated gear-driven machines.

Without the development of mechanical drives, broaching would have remained fairly well confined to the hydraulic field—and the speeds and tonnages characteristic of such machines. New mechanical drives are so smooth they duplicate—sometimes improve — hydraulic operation.

Although 60 fpm had been a generally accepted maximum, 200 fpm is no longer unusual.

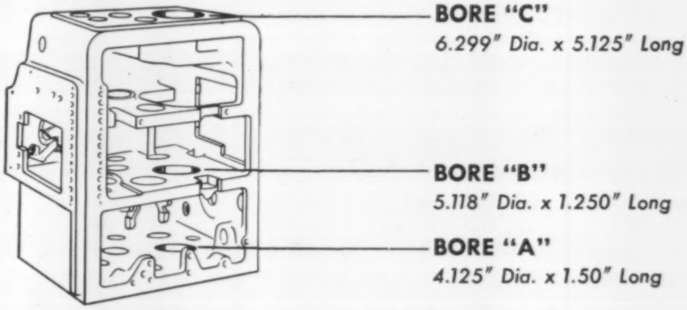
Mr. Whitmore . . .

We are concerned with two fundamental areas of the production problem. First we find our customers demanding increasingly complex work

HOW with one set-up
MONARCH MICROHONES
three bore diameters

Using a three-diameter tool and only one set-up, Monarch Machine Tool Company Microhones three in-line bores in lathe head stocks. Bore diameters are 4.125", 5.118" and 6.299". Stroke of Microhoning tool is changed only once during the working of all three bores. Former method of honing required multiple tooling and set-up.

How Monarch Microhones:



FIRST STROKE SETTING	Bore "A" is Microhoned while guiding on Bore "B" Bore "B" is Microhoned while guiding on Bore "A"
SECOND STROKE SETTING	Bore "C" is Microhoned while guiding on Bore "B"

How This Microhone Tool Operates:

A compound cone in the tool allows any one of the three bores to be Microhoned by expanding or collapsing individual banks of stones and guides. A selector sleeve shifts the cone rod to provide positive control of abrasives and guides.

Micromatic "How" knowledge, obtained through 27 years of experience in designing, engineering and manufacturing of Microhoning equipment for all types of applications throughout the world, can solve your production honing problems.

Learn how Microhoning will give you efficient stock removal, closer tolerances, accurate alignment and functional surfaces.

☐ Please have a Micromatic Field Engineer call.
☐ Please send Micromatic literature and case histories.

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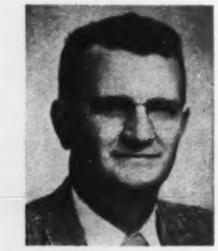


E. K. WHEAT
Supervisor, Process Research Section
Remington Arms Co. Inc., Ilion, N. Y.

WALTER K. BAILEY
President, Warner & Swasey Co.
Cleveland

handling equipment to make our high-production lathes almost fully automatic. More interest is being shown in the application of automatic gaging equipment to machine adjustment to keep within process tolerances. This is typical of the continuous, high-production operation.

Second, since the majority of metalworking is concerned with small-lot runs, we are equally concerned with making machines more flexible—more easily and quickly changed over from one job to another. To solve this problem, we feel numerical control systems hold great promise. We foresee the appearance of groups of related machines of many types, which are numerically controlled and assigned to certain classes of parts, on multiple operations. They will provide a degree of manufacturing not now attainable.

Mr. Wheat . . .

Ceramics are part of the neverending search for better tool materials, applications and performance. Modern concepts of machining and growing costs will continue to emphasize the necessity of better cutting tools and advanced technology.

With improved machine performance and economics, each new product or method is being more effectively applied. Cost estimates often fit the over-all production system, but they are not tailored to compare detailed processing costs. This situation has led to high cost processing and has increased the gamble factor. The high capital expense of a modernization program is prompting a preliminary search for alternates and a review of costing systems.

Mr. Bailey . . .

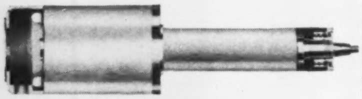
Machine tool output in 1957 should at least equal, probably exceed, that of 1956.

This expectation is based only in part on industry's widespread expansion plans and the backlogs resulting from them. It is founded in the main on steadily growing realization of the need to replace obsolete models by machines of new design that do more work at less cost.

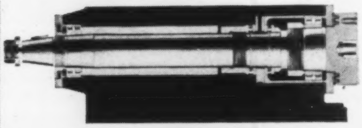
As builders of general purpose machines, our company is in contact with all types of metalworking. We see no soft spots or potential booms. There seems to be a steady over-all intent to try to boost volume in 1957 while keeping costs down.

SEE FOR YOURSELF
why you can be sure of...
- LOW MICROINCH SURFACE FINISHES
- TOLERANCES DOWN IN THE MILLIONTHS
- INCREASED PRODUCTION
- LOWER COSTS

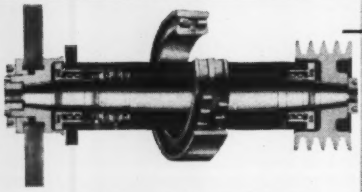
when you specify... POPE PRECISION SPINDLES



FOR SURFACE GRINDERS—
POPE 1, 2 and 3 HP, Totally Enclosed 1800 and 3600 RPM Motorized, Cartridge Type Spindles with massive shafts and big, double row cylindrical roller bearings having enormous capacity, superior performance and long life.



FOR BORING ROUND HOLES WITHIN MILLIONTHS OF AN INCH
POPE Heavy Duty Boring Spindles for smooth, chatter free, continuous high production of accurate parts. Again, look at the big cylindrical roller bearings and thrust bearings.



FOR CYLINDRICAL GRINDING—
POPE Cartridge Type and Wheel Head Belt Driven Spindles with the capacity to produce more work whether you plunge grind with a crush dressed wheel, remove surplus metal, or produce low microinch surface finishes. Note the super-precision radial bearings and ball thrust bearings.

FOR HEAVY DUTY MILLING—
POPE Spindles have the double row cylindrical roller bearings for the extra rigidity to support the cutting tool, and the double direction thrust bearings with the excess capacity to stabilize the shaft against endwise movement in either direction. This adds up to longer cutting tool life, more production, lower cost per piece.

POPE engineers and builds standard and special, precision anti-friction bearing Spindles for every purpose. Send us your specifications for prompt quotations.

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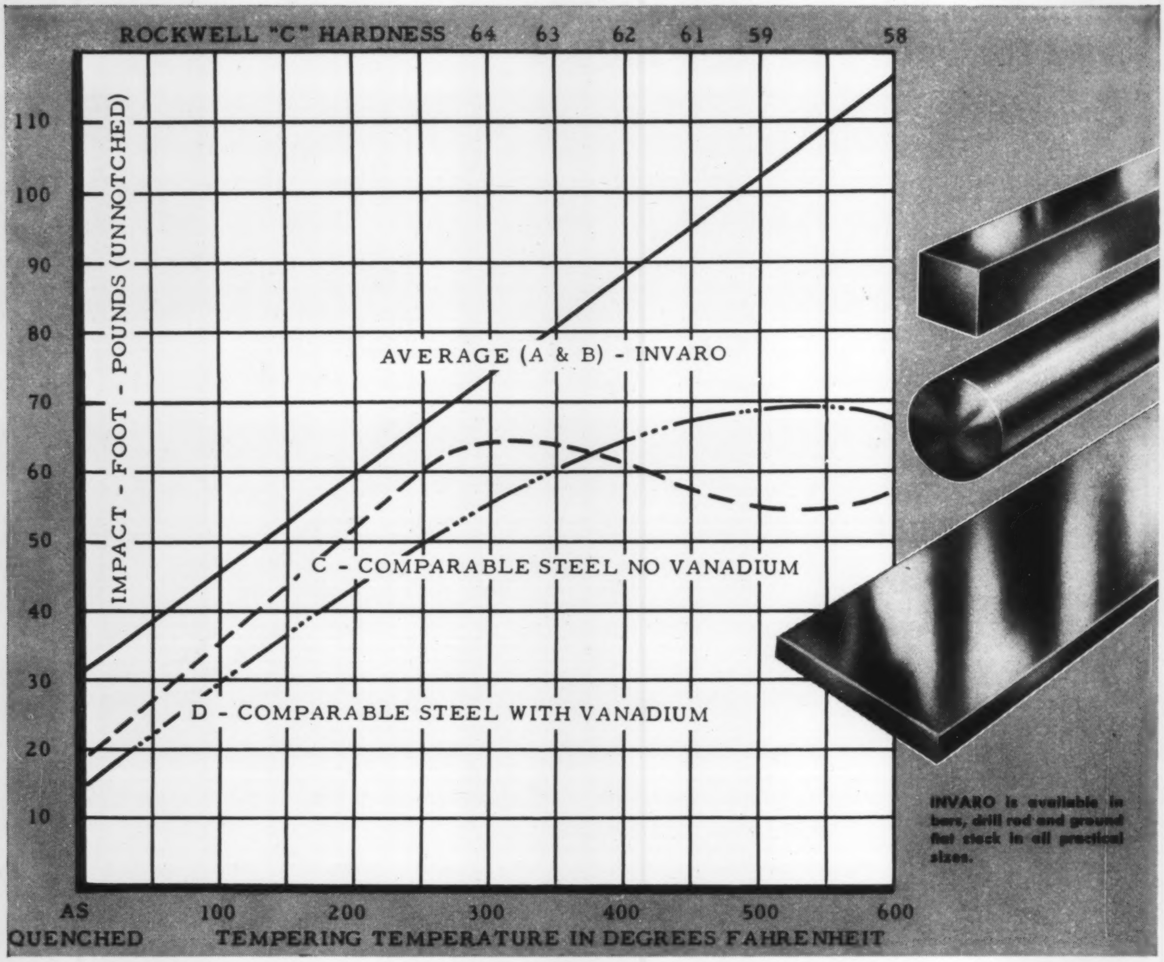

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INVARO . . . *IZOD-PROVED* THE TOUGHEST

of leading comparable oil-hardening tool and die steels

When the toughness of a tool and die steel is the critical factor of selection, Firth Sterling INVARO is the *toughest* of the tough! That's not just an opinion but a *fact.* Undeniable proof is established by the A.S.T.M. Izod Impact Test, results of which are graphically shown above, comparing steels both with and without vanadium.

INVARO shows a superior toughness in *all* ranges of temperature from a minimum advantage of about 12% to as much as 100% greater! This marked superiority is the result of Firth Sterling's advanced metallurgical practices combined with 67 years of experience in the art of making specialty steels.

Yes, when you want *toughness* in your tools and dies, combined with uniformity, excellent hardening properties and safety in heat treating . . . specify INVARO.

STEEL
CARBIDE

	All test samples were machined from half-inch annealed bar stock.							
Chemical Analysis	C	Si	Mn	S	P	W	V	Cr
Invaro A	.88	.34	1.22	.010	.020	.49	.19	.50
Invaro B	.94	.25	1.20	.014	.013	.53	.22	.49
Comp. C	.90	.33	1.24	.011	.025	.50	—	.55
Comp. D	.95	.34	1.27	.010	.020	.50	.21	.59

R-320

Firth Sterling

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K. R. BEARDSLEE
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Detroit

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Manager, Resins & Plastics Dept.
Shell Chemical Corp., N. Y.

TOOLING AND GAGING

FORUM ON TECHNICAL PROGRESS

Ceramic tools move into production . . . throwaway cutter tips gain acceptance . . . automatic gages will be smaller, less expensive . . . look for more free machining, hot-work tool steels . . . improved compounds aid plastic tools . . .

Mr. Conrad . . .

The outlook for the tooling field this year is excellent. There is every indication that the first six months will be among the best yet and that the year as a whole may set a record. There is a high backlog of orders for new machine tools and for special tooling in the tool and die shops.

You can expect rapid strides in automation improvements, especially in machine control and gaging. Machine programming improvements (such as numerical control) will make the advantages of automation more practical in small quantity production.

Perhaps the greatest challenge to tooling this year will come with the trend toward miniaturization of components. This creates tooling problems all along the line, but most of all it will stimulate developments in gaging and quality control.

Mr. Blackall . . .

The degree of precision with which mass-produced items are made is determined largely by the ability of industry to measure them. As more accurate method of size determination become readily available, tolerances keep in step and tend to narrow. Yesterday's gage tolerances become today's working tolerances in production.

Concurrent with this trend is the effort to eliminate or minimize the personal equation in gaging. This and the natural trend toward automatic production explain the growing popularity of automatic or partially automatic gaging machines or instruments as a substitute for manual gaging.

The pre-eminence of the fixed gage is gradually giving way, especially in the mass production industries, to the products of the instrument field, such as air gaging and measurement by electronics. Nevertheless, the fixed gage will probably be with us always.

Mr. Beardslee . . .

The stepping up of machining speeds has been due in part to superior carbide cutting tool materials and, in part, to semi and fully automated machine tools.

This trend is expected to continue more rapidly in the next year or two for two reasons. One can be traced to the development of even better carbides, and the development of cemented oxide cutting tools which many firms are actively investigating as the result of recent outstanding applications.

There also is a definite trend toward manufacturing to closer tolerances, such as in casting and forging, which ultimately may eliminate rough machining and reduce machining to fast finishing operations.

With the finishes now possible with some of the so-called ceramic type tools, it is entirely within the realm of possibility that many finish-grinding operations can be taken over by these cutting tools—if machines can be developed for the purpose.

Mr. Swackhamer . . .

With epoxies, stretch dies, drop-hammer dies, contour checking fixtures and other tools with intricate curves can be produced without the need for costly machining. One of Canada's largest aircraft manufacturers is tooling up for its newest delta-wing jet interceptor entirely with Epon resin formulations. It also reports superior results with a new epoxy splining compound which has replaced phenolics and plaster in the preparation of airfoil master models. These compounds can be molded on even vertical curves and contours.

A New York aircraft components manufacturer is fabricating sheet metal components with epoxy resin

E. C. HUGHES
Executive Vice President, Bay State
Abrasive Products., Westboro, Mass.

LEIGHTON A. WILKIE
Chairman, DoAll Co.
Des Plaines, Ill.

R. ALLEN SOULER
Automatic Control Engineering
Federal Products Corp.
Providence, R. I.

STEWART G. FLETCHER
Director of Metallurgy
Latrobe Steel Co., Latrobe, Pa.

dies. One of these dies formed sharp radiuses in over 2500 pieces of 0.020 in. stainless steel before showing wear—and the die was repaired in 2 hours. One of the leading farm equipment manufacturers considers epoxy resins ideal for foundry patterns, coreboxes and drier master patterns because the plastic patterns are much smoother than metal or wood and are easier to draw out of the cope or drags without disturbing the mold.

Mr. Hughes . . .

The tremendous forward surge of our national economy means constantly increasing demands on the entire metalworking industry. They may be summed up in a single challenge: Produce faster and more efficiently to maintain a profit margin in the face of almost universal cost increases.

Much of this challenge is rightly passed on to grinding wheel manufacturers, since grinding is a vital metalworking factor. We are keenly aware of this challenge, and are already anticipating its specific demands for: More applications of grinding wheels to mass production, still closer matching of the cutting characteristics of a wheel to its job requirements and new bond, abrasive and structure combinations with special properties for grinding the new superalloys.

Rapid progress is being made in all these areas. Manufacturing capacities are being expanded to meet the demand for more grinding wheels; research facilities are already expanding in both scope and intensity to create the new wheel types needed, and a concerted educational program is under way for all personnel concerned with grinding, to promote a greater understanding of its basic principles.

Mr. Wilkie . . .

High speed steel band saws have proved so superior that they have created a revolution in bank machining. New machines are able to greatly amplify the basic advantages of slicing through the workpiece with a narrow continuous cutting tool. High speed steel band saw tools require coolant and hydraulic work feeds—meaning that entirely new models are required.

The new models are producing enormous savings on cutoff work, production slotting and slitting. They also are doing production work which was impossible, such as slicing thin sections from billets, slicing off sections of forging dies and shaping huge blocks of steel which remain stationary while the saw moves.

Mr. Souler . . .

Many new machine tools are being designed to incorporate in-process and postprocess gaging. The in-process gage keeps parts being produced as close to machine capability as possible. The postprocess gage watches for and feeds back signals to correct for drift.

We look for more extensive use of electronic gaging devices. New designs will be smaller, more compact and less expensive. Printed circuits, miniature tubes, transistorized circuits and fewer components will help to bring down the cost.

We look for more precision in machine tools. Tighter tolerances will force new design concepts in mechanical and hydraulic functions. Friction in such devices is limiting machine capabilities in many instances.

We look to more useful integration of the machine tool and automatic gage. In a sequence of operations divided among a group of machines, it is not profitable to find scrap at the end of the sequence. Neither does it help much to have manual gaging in between the sequences—this is slow, tedious and often too late. Intermediate and automatic postprocess gaging fits into this program to keep a watchful eye on offending tools.

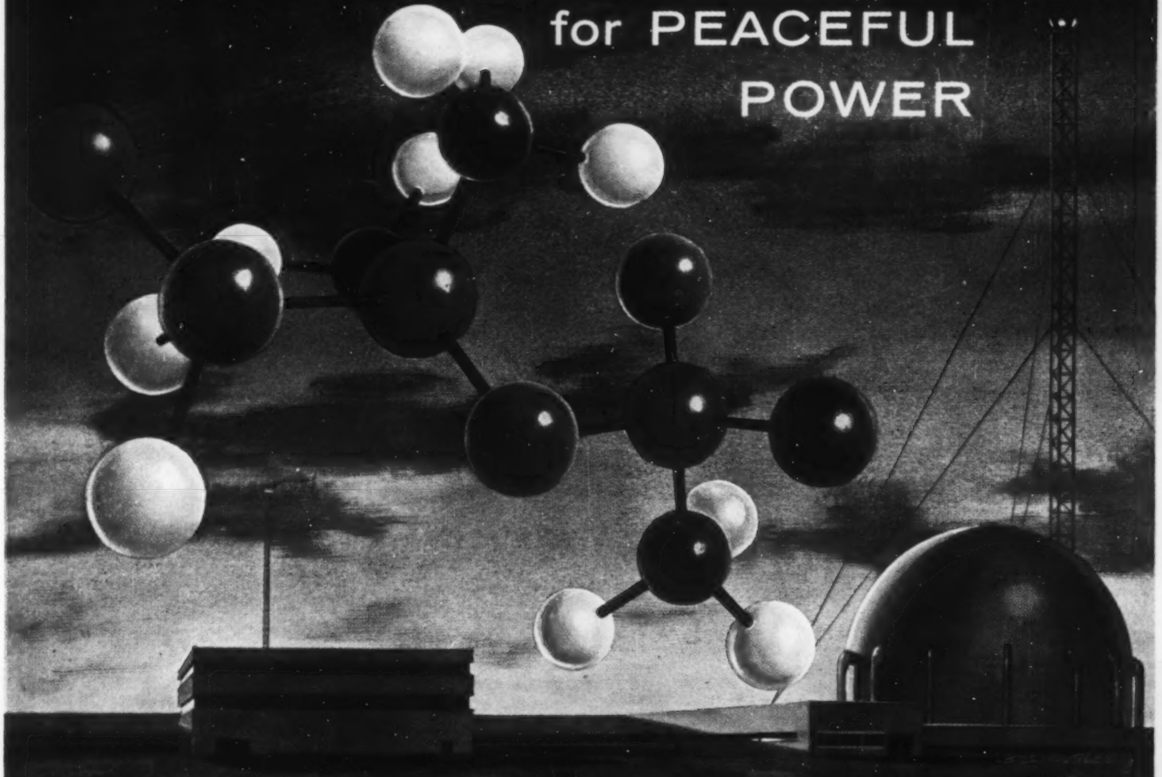
Mr. Fletcher . . .

We have observed a district trend toward the upgrading of tool and die steels. It has resulted in wide acceptance of the highly abrasion resistant, high vanadium die steel and high speed steels, which will undoubtedly continue. Research on even higher grade materials is under way, the aim being to get better production from modern tools and dies.

Free machining tool steels have gained almost universal acceptance, and this development has been extended to the low alloy hot work steels. Extension of free machining

ATOMS

for PEACEFUL POWER



FABRICATED STEEL by INGALLS

The nation's first privately financed atomic power generating station is now underway on the Hudson River at Peekskill, N.Y.

The $55 million station, being built by the Consolidated Edison Company of New York, will produce enough electricity — 236,000 kilowatts — to supply the home needs of about a million New Yorkers.

Ingalls, with years of experience in the power plant field, was selected to fabricate the structural steel and erect the $3 million plant, the largest private atomic power generating plant in the United States.

The Ingalls Iron Works Company is a specialist in steel for power plant construction having served 46 Electrical Power Companies on their major power house projects. Our long experience in the field, our modern facilities and modern methods enable us to handle any major contract with speed, economy and efficiency.

If your company is contemplating a new power house, or expansion of present plants, Ingalls offers you its services — fabricated steel, steel erection, or both.

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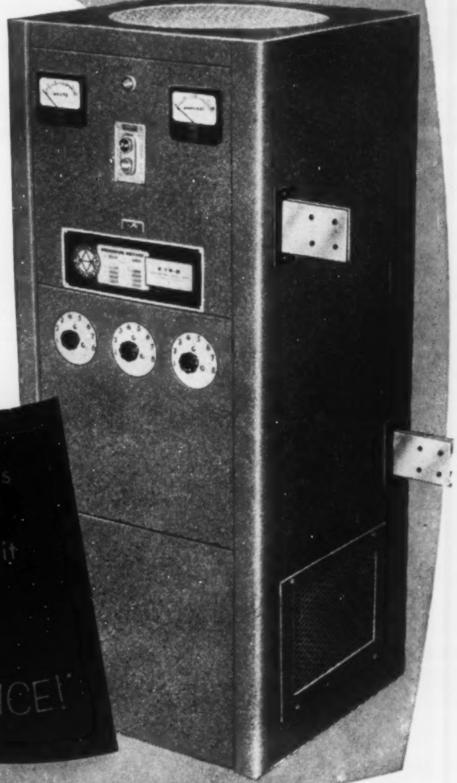

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W. B. DUNCAN
Chairman, Wesson Co.
Ferndale, Mich.

additives to these medium carbon steels is making possible the introduction of prehardened steels for many hot work tools and dies. Next year will see wide application of these free machining hot work tool steels.

One interesting current trend is the increased attention to tool steels for engineering applications, particularly in the aircraft field, because of their excellent, high strength and high temperature properties. We anticipate increased usage in this field and foresee the need for a stepped up research program to develop the physical and mechanical property information which has been lacking.

Mr. Duncan . . .

In 1957, more and more emphasis will be placed on the reduction, or elimination, of tool maintenance, the reduction of tool change time and the reduction of over-all tool costs per piece.

These objectives will dominate tooling in a year in which metalworking will see production at or near the 1956 levels through the second quarter and will greatly influence a more rapid turn to the throwaway principle in carbide tooling.

The goal of maintenance reduction and quicker tool changes was made evident in a recent study of metalworking. It revealed that throwaway usage would jump from the present industry average of 15.8 per cent to 23.9 per cent of all single point tooling.

The outlook for milling with throwaway inserts which eliminate all maintenance grinding and significantly speed up tool changes, is far more promising than that in turning since regrinding of cutters is more

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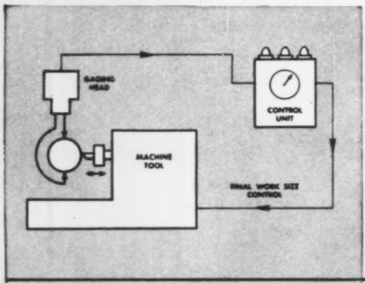
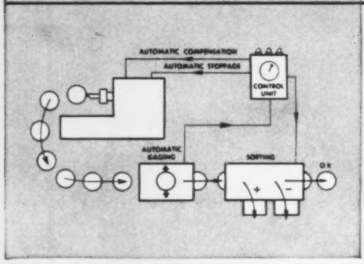
Diversity in Automatic Control



IN-PROCESS
control utilizes gage to make tool retract when part has been machined exactly to correct size.

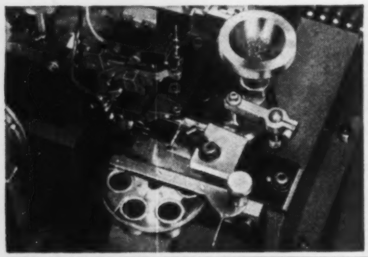


POST-PROCESS
control provides feedback of corrective signals from automatic gage to machine to maintain part uniformity. Federal pioneered both this and "In-Process" type of control.

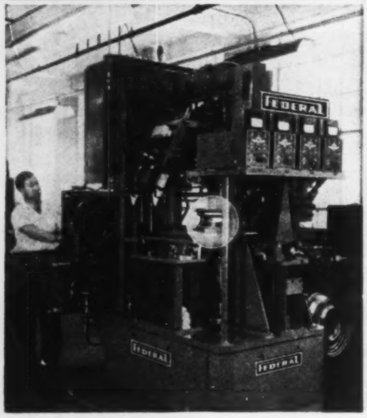
Any type of precision gage should be reliable, but when the gage becomes part of the automated process, reliability becomes of premium importance. There's a lot at stake. Over the years Federal has developed numerous ways to greatly increase Automation Gaging reliability. For instance . . . using extremely low voltage at sensitive switching contacts. This eliminates pitting, and tremendously prolongs contact life, maintains precision. And, Federal Automatic Gages employ electronic switching . . . vastly more accurate, faster, and more maintenance-free than the use of mechanical means to actuate work-handling relays.

You don't come by these features overnight. They are the result of hard-headed experience acquired in the designing and building of many diversified types of automatic gages. This extra reliability is bound to pay off. It's reliability which you not only can afford, but which *you cannot afford to do without.* And, only Federal provides it!

Diversity in Automatic Inspection



WATCH JEWELS
Each jewel is the size of a pin-head, yet this gage automatically handles, checks and sorts 1800 per hour! Gage measures hole in jewel only .008" in diameter.



TRUCK WHEELS
This Federal Gage automatically checks 500 massive truck wheels an hour for radial and lateral runout, sorts into good and bad.

24,000 PIECES PER HOUR
This high speed automatic gage checks diameter of various size ball bearings, sorts into 12 categories of .000010" each!

21 DIMENSIONS
2400 per hour.
This gage is adjustable to automatically handle 13 sizes of turbine blades, measuring almost two dozen dimensions in only 4 stations.

in Automation Gaging!

SIMPLICITY THRU STANDARDIZATION

UNITIZED CONSTRUCTION
Critical elements are specially constructed for quick replaceability.

Automation will never become wholly standardized, but Federal — because it has had such long-time experience in this field — is able to meet most control and inspection demands using basic, standardized components. This means lower costs for you, for one thing . . . but much more importantly . . . it means greater reliability of performance. It means this too — much less dependence on technical talent and immediate service. Standardized units can be replaced with spares quickly and easily, should the need arise. What sizable savings in downtime costs!

This is the kind of common sense design you should have in return for your Automation Gaging investment . . . and Federal can give it to you. Ask your nearest Federal representative to come in and discuss this in terms of your own needs.

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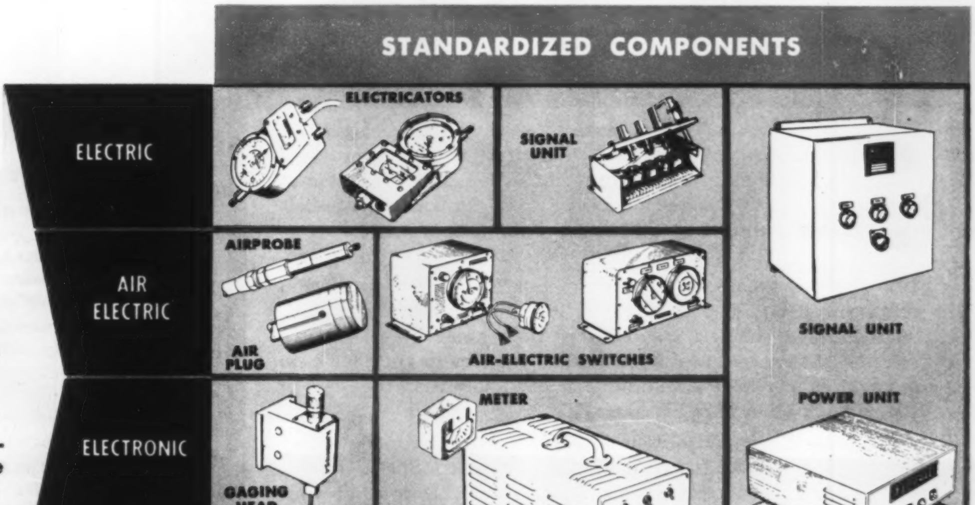
4 SYSTEMS OF GAGING
***Only* Federal provides this flexibility to meet gaging requirements more economically.**


STANDARDIZED COMPONENTS
ELECTRIC
AIR ELECTRIC
ELECTRONIC
AIR ELECTRONIC
ELECTRICATORS
SIGNAL UNIT
AIRPROBE
AIR PLUG
AIR-ELECTRIC SWITCHES
SIGNAL UNIT
METER
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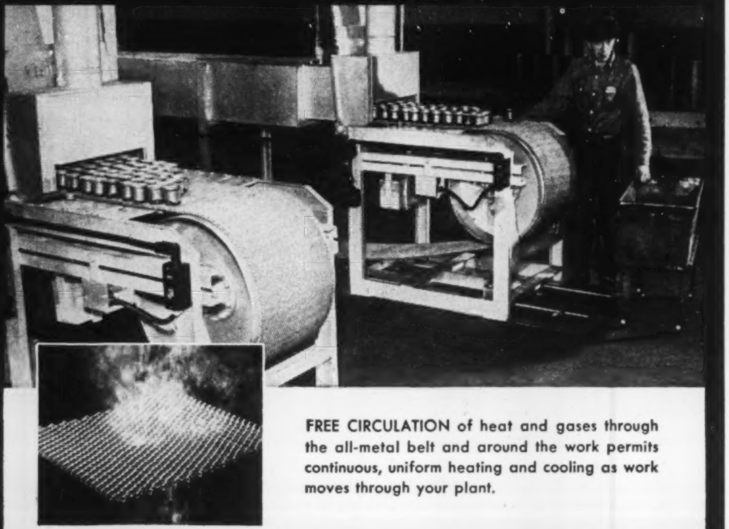
Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging

Cambridge

WOVEN WIRE CONVEYOR BELTS

take the "hot spots" out of

ANNEALING & BRAZING



FREE CIRCULATION of heat and gases through the all-metal belt and around the work permits continuous, uniform heating and cooling as work moves through your plant.

By combining controlled movement with free circulation of process atmospheres, Cambridge Woven Wire Conveyor Belts eliminate batch annealing and brazing. There is no formation of "hot spots" which produce local stresses. Continuous, belt-to-belt flow through subsequent quenching and washing operations as well as heating, cuts costs and provides fast, uniform production.

Not only does the open mesh construction provide free circulation of gases . . . it also permits rapid drainage of process solutions. The all-metal belt is corrosion resistant and impervious to damage at temperatures up to 2100°F. Cambridge belts have no seams, lacers or fasteners to wear more rapidly than the body of the belt . . . no localized weakening.

Cambridge Woven Wire Belts for heat treating are made in any size, mesh or weave, and from any metal or alloy. Special retaining edges or cross-mounted flights are available to hold your product during inclined movement.

Call in your CAMBRIDGE FIELD ENGINEER to discuss how you can eliminate batch handling from your heat treating. Look under "BELTING, MECHANICAL" in your classified phone book. OR, write for your copy of Special Report, "6 Ways to Increase Heat Treating Production" and 130-PAGE REFERENCE MANUAL giving mesh specifications, design information and metallurgical data.

The Cambridge Wire Cloth Co.

WIRE CLOTH | METAL CONVEYOR BELTS | SPECIAL METAL FABRICATIONS

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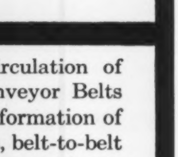


G. M. CALVERT
President, Jes-Cal Co.
Fraser, Mich.

M. EUGENE MERCHANT
Assistant Director of Research
Cincinnati Milling Machine Co.
Cincinnati

complex and costly. At the same time, considerable attention will be devoted to applying the throwaway principle to other types of tooling such as single and multiple-bladed boring tools.

Mr. Calvert . . .

The trend toward increased automation in the production of such things as engines, hydraulic units, compressors, gears and bearings and additional power and service requirements has created urgent demands for completely dependable size control in cylinder bores and related parts.

A simple development of size control works both automatically and mechanically, and either vertically or horizontally. Its success has been proved in production and has been evidenced in a number of ways, such as reducing the number of sizes carried for the selective fitting of parts.

As a result, inventory costs have been reduced. Assembly errors and losses have been virtually eliminated.

Mr. Merchant . . .

A widespread attack is being made on cutting tool wear. The fundamental physics and chemistry of wear are being explored with new vigor and new points of view. Such items *all you've wanted in*

PRODUCTION TYPE—SIZE CONTROL

HONING TOOLS

DESIGN AND OPERATING SIMPLICITY

A new rigid shaft construction, without "universal joints" makes the Jes-Cal size control hone a solidly supported extension of the machine spindle. This construction eliminates the need for actuating bushings and bushing bracket, permits generation of bore accuracy and correction of error within limits of only a few ten-thousandths of an inch, closer parallelism of bore axes as in cylinder blocks, and eliminates "swipes" as the tool leaves the bore. Simpler tool design with relatively fewer, precision built parts minimizes chatter, permitting faster, cooler, more positive cutting action with lower cutting pressure.

The Jes-Cal size control gage is positioned around the honing tool spindle. It has carbide tipped contact points for long, hard service of many months without losing size, and is the most positive, dependable and economical method of size control available. This gage stops honing action immediately and automatically, through a simple limit switch, when the gage enters the bore.

DEPENDABLE MACHINING ACTION

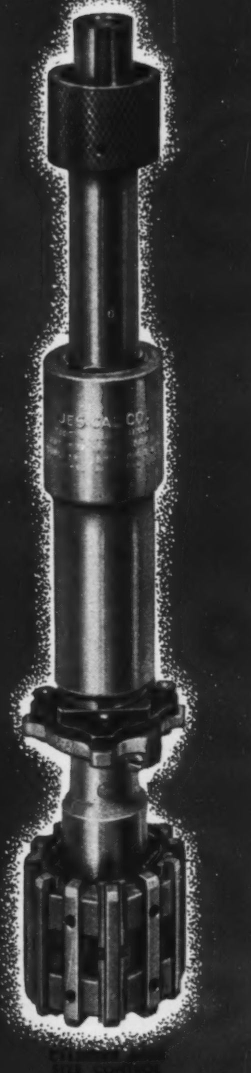
The Jes-Cal rigid shaft construction delivers a maximum of spindle power application, permits extremely fast and efficient stock removal, and makes possible corrections of large amounts of error such as out-of-roundness, snakiness, bell mouth and taper. Bore accuracy may be held easily within the range of 0.0001 to 0.0005-inch limits in most applications.

LOWER OPERATING COSTS

The above features with their many refinements permit Jes-Cal size control honing tools to record much lower operating costs in production as compared with previous experience.

Write for Bulletin JC-101

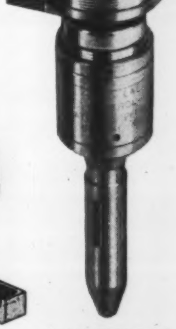
JES-CAL
SIZE CONTROL
HONE



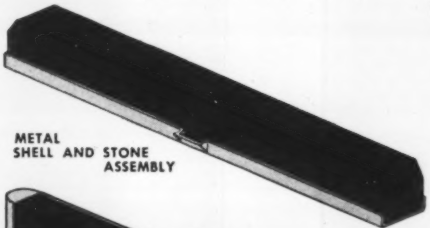
[illegible]
SIZE CONTROL
HONING TOOL

JES-CAL
SIZE CONTROL HONE
PATENT APPLIED FOR

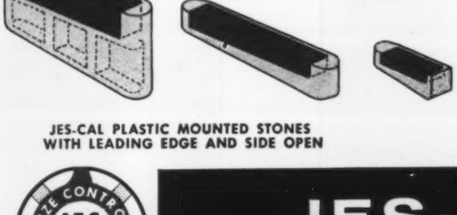
CON ROD
SIZE CONTROL
HONING TOOL



SMALL DIAMETER
SIZE CONTROL
HONING TOOL.



METAL
SHELL AND STONE
ASSEMBLY



JES-CAL PLASTIC MOUNTED STONES
WITH LEADING EDGE AND SIDE OPEN

SIZE CONTROL
JES
CAL
HONES

JES-CAL COMPANY

31485 GROESBECK HIGHWAY • FRASER, MICHIGAN

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LOUIS POLK
President, Sheffield Corp.
Dayton, O.

as intermetallic diffusion, the details of heat flow in cutting and the characteristics of chemically produced solid films at the chip-tool interface are receiving attention as important controlling factors in tool wear.

Awareness of the importance of making careful tool-wear measurements to evaluate and improve production operations is growing. The use of the radioactive tracer method is on the increase.

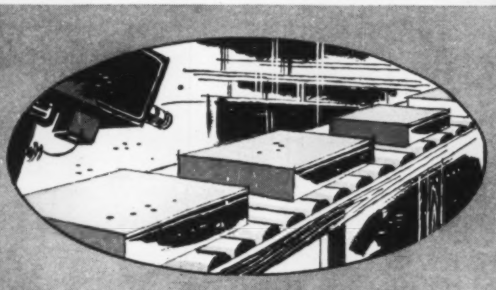
A fresh look is being taken at the tool material itself. One result of this emphasis is increased interest in ceramic tooling. These materials are being given a chance to prove whether they can live up to the promise they showed in the laboratory: Greatly increased production rates because of their low wear rates at high cutting speeds. They look good so far, although further improvements are needed before general use is possible. They promise to take over a number of machining operations.

Mr. Polk . . .

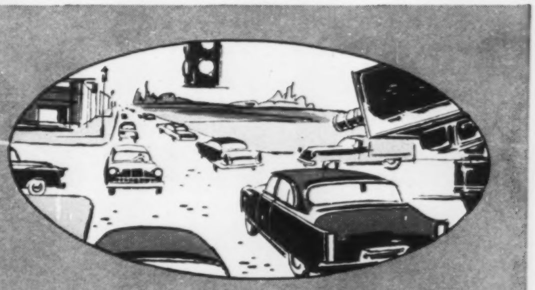
Automatic gaging long ago progressed past the experimental stages. It is growing, in units and in complete systems of autometrology (automatic measurement), on whatever scale required to meet the precision needs of automated processes or plants.

The over-all engineering involved in autometrology required the development and manufacturing of integrated means to prevent defective parts. Gages and controls used are more than detectors. They are controllers of the machine tools and assembly machines which anticipate and avoid trouble. It necessarily involves the planning and installing of

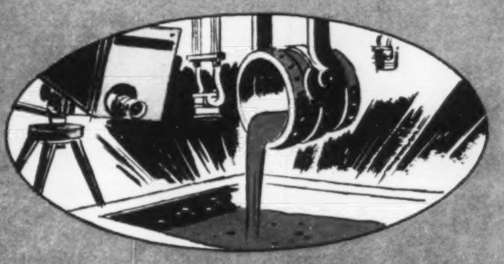
GENERAL ELECTRIC CLOSED CIRCUIT TV PROVIDES RELIABLE VISUAL COMMUNICATION AT LOW COST



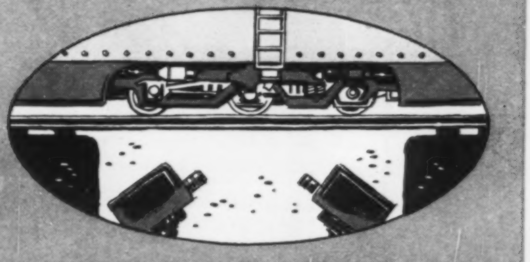
REMOTE OBSERVATION OF INDUSTRIAL OPERATIONS



TRAFFIC CONTROL AND MATERIALS HANDLING



CONSTANT OBSERVATION OF HAZARDOUS AREAS



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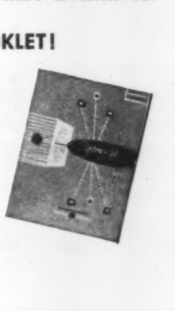
in fact, almost—ANYTHING... ANYWHERE... ANYTIME!

THREE self-contained units, with plug-in connecting cable, bring you a complete visual communications system that is effective, efficient, and practically foolproof. Each unit is portable, and ruggedly built to withstand years of heavy industrial use—under many conditions of heat, humidity, vibration, dust, fumes, etc.

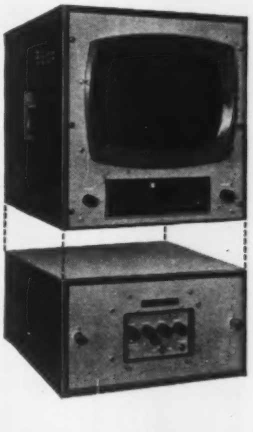
The light-weight, compact units of the INTRA-TEL system are easily moved to cover changing needs and situations. Additional monitors or standard TV receivers can be used to provide multiple viewing locations, either locally or remotely. A multiple camera system, with accessory switching equipment, is also available.

WRITE TODAY FOR FREE BOOKLET!

This new, illustrated booklet explains the entire INTRA-TEL System...lists many industrial applications. Your copy is waiting—write today, on your letterhead please, mentioning ECL-53 for black and white, or ECL-39A for color system. *General Electric Company, Industrial Electronics Division, Broadcast Equipment, Section A6617, Electronics Park, Syracuse, New York.*



The basic system is housed in three small, compact units... easy to place, easy to move!



The CAMERA

Type TG-2-A. Takes the picture of subject, scene, or action.

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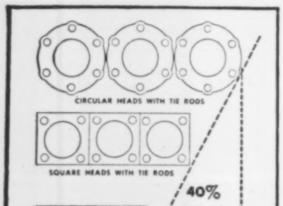
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40% SPACE SAVED
T-J SPACEMAKER . . . provides additional room for adjacent equipment without sacrificing strength.

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PHILIP M. McKENNA
President, Kennametal Inc.
Latrobe, Pa.

proper gaging and machine controls during design to achieve the necessary complete integration.

As metalworking progresses into new and more complex shapes, forms and sizes, and as closer machine tolerances are established to meet new standards, there must be continued improvement in the speeds and accuracies of gage and control elements. These improvements must, at the same time, be efficient, practical, and versatile enough to match the increased speed cycles and greater versatility of modern machine tools and assembly machines.

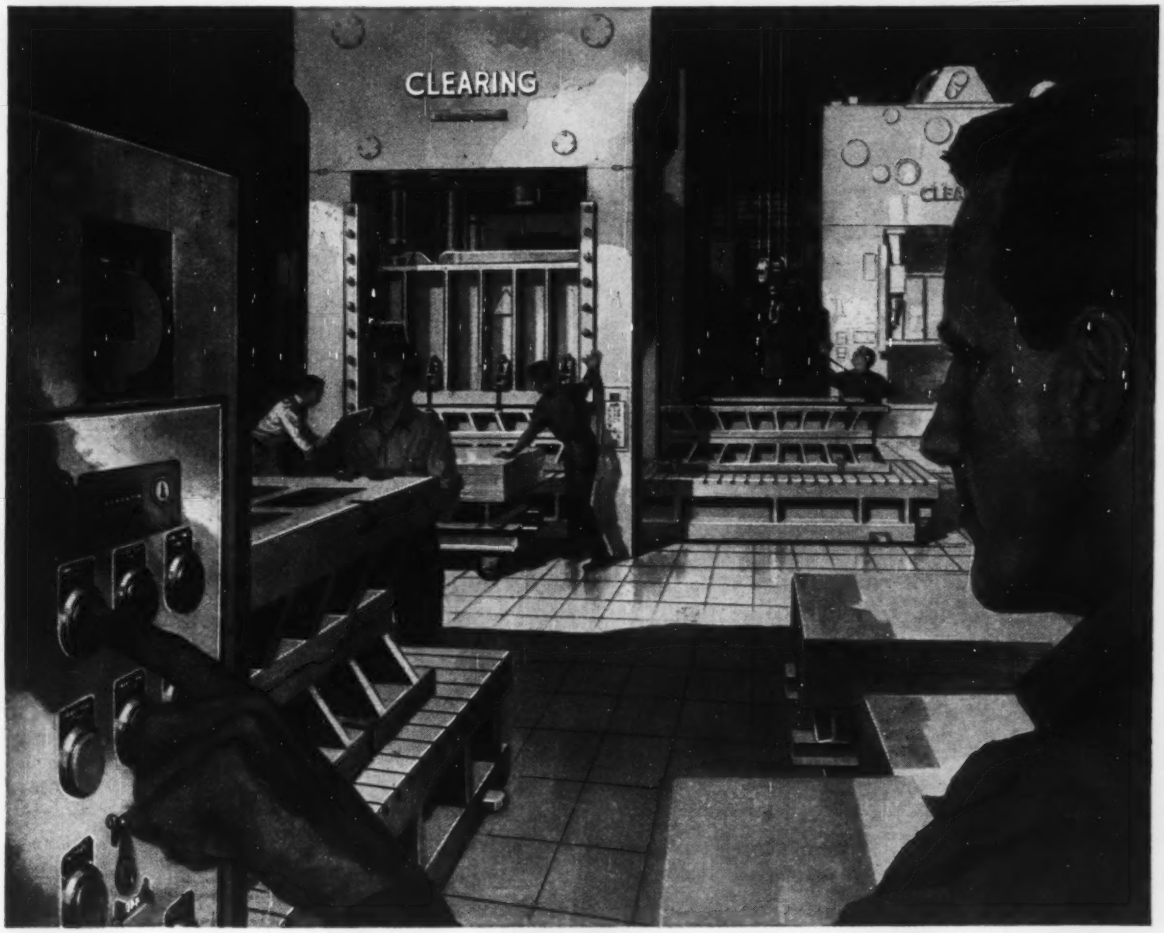
Mr. McKenna . . .

Acceptance of indexible multiuse hard carbide blanks in mechanically held tools was rapid in 1956. The use of harder grades supported by a thick shim of softer tungsten carbide alloy has been noted.

Where the mechanically held carbide can replace the brazed tool, costs per piece have gone down. More importantly, the saving in man-hours has been high.

Ample supplies of tungsten and cobalt provide an opportunity for the adoption of hard carbides in elements of construction like boring bars. Guns drills with solid tungsten carbide shanks (a soft grade) and silver-soldered cutting tips deflect only one-third as much as a steel bar of the same cross section and length. Chatter is minimized, with a substantial improvement in tool life, as well as greater precision of the bore.

Titanium carbide alloys which have high mechanical strength at 1800 to 2000°F are finding uses in machine shops and as elements of construction in high temperature engines and thermostats.



Imagine! Presses where dies are changed the way you turn on the light!

Here's an arresting new method to put more productive hours into a working day. Clearing moving bolster presses shrink the hours required from changing jobs on a press, or a press line, to minutes. Push-button die setting reduces downtime in direct proportion to the amount of job changing required in a plant—saving up to 50% of lost production hours in some instances.

These new Clearing presses are designed with a bolster that is rolled from left to right through the die area. Dies for the next job are set up outside the press during a press run. When the current job is completed, a touch of the control button powers the new dies into position under the slide. Power actuated clamps release the old dies, clamp in the new—and with proper slide adjustment (also powered) the new job is ready to go.

Clearing engineers have designed these presses to combine with other bold new ideas for increasing press productivity. Moving bolsters will work, for example, with Transflex feeds. They may also be designed on either top drive or bottom drive machines. If this unusual new idea in press design appeals to you, remember it is only one of many Clearing innovations that can help you boost manufacturing output. Call on a Clearing engineer to discuss these ideas. There'll be no obligation, of course.

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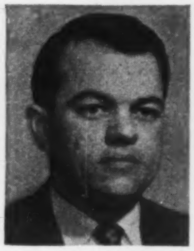
Chambersburg, Pa.



RICHARD B. STRIBLEY
Manager, Phosphate Coating Div.
Detrex Chemical Industries Inc.
Detroit

A. O. SCHAEFER
Director of Research
Midvale-Heppenstall Co.
Nicetown, Pa.

J. F. LELAND
Assistant Sales Manager
Parker Rust Proof Co.
Detroit

FORMING

FORUM ON TECHNICAL PROGRESS

Hot extrusion succeeds as process for making finished shapes . . . Costly and difficult-to-machine metals continue the pressure for chipless production . . . Presses add functions to become self-contained production units . . .

Mr. Clarke . . .

As trends toward more intensive mechanization of manufacturing processes grow, critical looks will be taken at forging and forming operations. There have been several installations of practically complete forging automation for single items, and the success of these will doubtlessly encourage others to explore their advantages.

Areas challenging development: Stock handling, stock orientation, stock manipulation and versatile handling equipment. Significant progress has been and will continue to be made in these fields.

First installations of automatic forging equipment designed to accommodate a variety of jobs already are being placed into production. As operating experience with them accumulates, they will, without doubt, mark the beginning of a significant change in production methods for closed die forgings.

Mr. Stribley . . .

Manufacturers no longer consider cold extrusion, cold drawing or cold forming experimental processes. With the information and experience they now have, they no longer need to depend on suppliers only for technical information. They know what they want and what they need to accomplish outstanding results.

Years of experimenting with such things as surface treatment, lubricants, processing cycles, dies, presses, types of steel and heat treatment have made it possible to accurately plan procedures and predict results.

Metallurgists can accurately predict how certain steels will react under various conditions. Diemakers are familiar with the intricate design of cold extrusion tools. Guesswork is almost a thing of the past.

Mr. Schaefer . . .

Increasing attention will be given to the quality of forgings.

Watch the development of these trends in the months ahead:

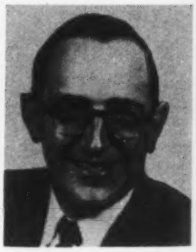
1. Increasing use of ultrasonic inspection, with the beginning of some standardization of technique and appraisal.
2. More general use of electric furnace steel for forgings, even the large ones. Vacuum-pouring techniques will make this more feasible.
3. Methods of melting offering possibilities of further improvements in steel quality, notably in consumable electrode melting.
4. Re-evaluation of the chemistry and heat treatment of steels used for forgings with regard to brittle fracture criteria.
5. Development of techniques that will result in forgings which are more closely shaped to the finished component. Metallurgically, the object is to produce flow lines where they will be most beneficial. There is also an obvious strong economic reason. Modern equipment is making it more feasible to do this.

Mr. Leland . . .

Much progress has been made on lubrication for severe forming operations. A prelubricated sheet (Bonderite and Bonderlube applied at the mill) has been well received, and demand is expected to grow. Some companies have installed their own facilities for phosphate coating and lubricating their production requirements. One appliance manufacturer has utilized flat polished sheet which is coated and lubricated prior to forming, eliminating later costly form polishing. The benefits sought: Wider latitude in steel specifications for deep drawn parts, reduced breakage, reduced press down time and smoother final finish.

All the major auto companies have established cold extrusion development groups to co-ordinate design with this method of manufacturing.

MELVIN D. VERSON
Vice President, Marketing
Verson Allsteel Press Co.
Chicago



R. A. POWLEY
General Manufacturing Manager
Aircraft Engine Div., Ford Motor Co.
Chicago

ALEXANDER ZEITLIN
Vice President
Birdsboro Steel Foundry & Machine Co.
Birdsboro, Pa.

CARTER C. HIGGINS
President & General Manager
Worcester Pressed Steel Co.
Worcester, Mass.

As a result, the role of lubrication is better understood, the benefits gained are more evident and the savings are becoming more attractive because of advancing steel prices. While emphasis is on the development and production of close tolerance cold extruded parts made in a single press operation, the trend is to redesign hot forged and machined items of complex design to permit production by cold extrusion.

Mr. Verson . . .

The design and manufacture of presses have progressed to a point where press capacity or the complexity of parts to be formed is no obstacle.

Extrusion, the working of steel to shape with close dimensional control at room temperature by plastic flow, will ultimately lead to the chipless production of many metal parts.

Research and development in production methods and applications of the basic Verson Transmat press unit for cold extrusion of steel are under way. Several high production lines are in operation. Others are in process, and still more are in stages of development and research.

Mr. Powley . . .

The Ford Aircraft Engine Division continues to work toward chipless production. Projects in advanced stages of development include:

A titanium ring made by flash welding four 90-degree preformed segments to make a forging which weighs approximately 25 per cent more than the finished part.

Compressor rotor blades held to print tolerances on the airfoil by grade rolling in a massive roll stand.

An engine case made by flash welding four 90-degree preformed segments to produce a forging with a minimum of machining stock and at 65 per cent of former cost.

A turbine driveshaft produced by roll forming which substantially reduces material requirements and machining time.

Other divisions are cold extruding bearing races for driveshaft universal couplings and using transfer presses to make close tolerance forgings for differential side gears, ring gears and pinions.

Mr. Zeitlin . . .

The trend in hot extrusion is toward the production of finished products as well as tonnage shapes. Gun barrels and gas turbine shafts produced integrally with turbine wheels are coming. There will also be much greater production of extruded heavy pipe for high temperature, high pressure applications in steam power plants.

The main advantages are already firmly established. Hot extrusion reduces machining time by as much as 50 per cent, eliminates chips and saves between 25 and 60 per cent on materials.

Ordnance appears to be the biggest market for hot extruded parts. The need is also great for economically produced gas turbine parts and construction elements for aircraft.

The metalworking industry can look forward to the development of specialized machinery which will combine several operations, including forging, piercing, upsetting and extruding. The cost of such equipment can be written off by savings in metal in less than one year. The forerunner of such a machine is operating satisfactorily.

Mr. Higgins . . .

After nine months, 1956 shipments were equivalent to those of the independent stamping industry during record 1953. This year's will pass 1955's by a fair margin.

Replies to a recent survey show a halting, even a reversal, of the trend of stamping users to make their own. A number of companies find they can buy stampings more cheaply than they can make them.

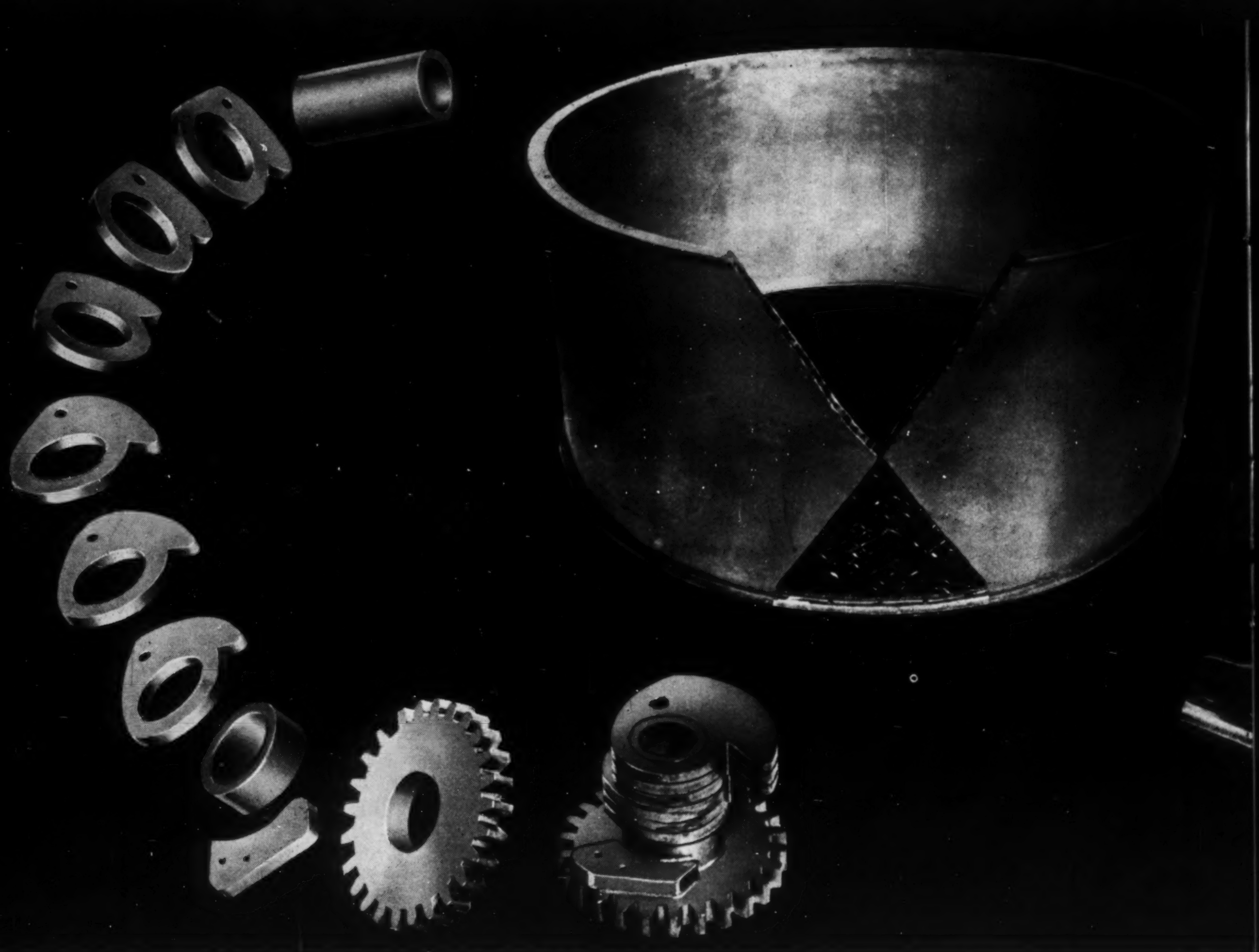
There is a definite trend for profits to be squeezed by rising costs—and this always favors stampings made on fast-acting presses. A marked trend toward the increased use of precision stampings shows a desire to do away with costly machining and grinding processes.

Considerable technical progress has been made in the drawing and forming of titanium alloys. The quality of the raw material has been improved markedly. Much more is known about factors like proper temperatures, press speeds and lubrication procedures for drawing shapes from such alloys as 6Al 4V.

Mr. Belden . . .

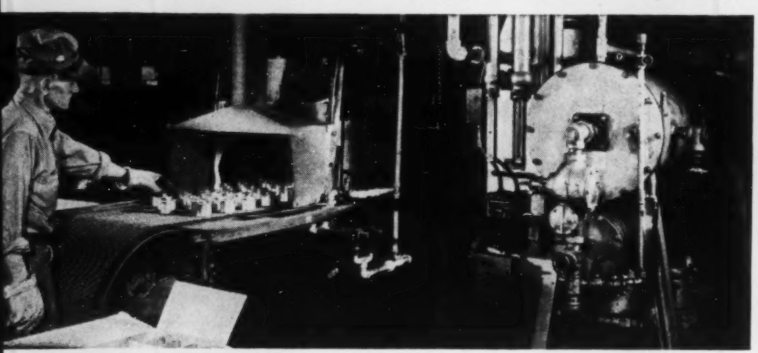
The powdered metal industry is continuing its steady growth. The trend with respect to compacting presses shows more than ever that the demand is for those that require simple tool sets.

To meet the requirements of the



Versatility of furnace brazing is shown in these applications. Complex assemblies like the cam-and-gear cluster on the left can be fabricated from punched laminations brazed securely in a General Electric mesh-belt furnace. Required contours are obtained without expensive machining from solid stock.

Thin sections can be joined to heavy sections to produce light-weight rigid structures without sacrificing strength or inducing local distortion. Honeycomb structure at top center weighs about one fourth as much as solid assembly of same rigidity. It is typical of design improvements made possible by brazing in General Electric furnaces.



Continuous production of small parts in this General Electric mesh-belt furnace is carried out by loading assemblies directly on the belt. Protective atmosphere equipment, at right, eliminates need for flux in most cases, keeps parts clean enough to be passed directly from the furnace, without cleaning or pickling.

Automatic charging, and discharging and return conveyors of this General Electric roller-hearth furnace make it almost self-operating, reduces handling costs. G-E roller-hearth furnaces handle heavy assemblies and are well suited for automated lines.

GENERAL ELECTRIC SELLS
A COMPLETE LINE OF
HEAT PROCESSING EQUIPMENT

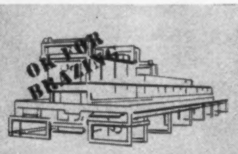
FURNACES • METAL-SHEATH • INDUCTION

OK FOR
BRAZING

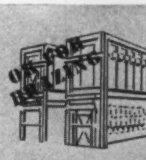
Box

OK FOR
BRAZING

Cylindrical Pit



Roller Hearth



Elevator

Produce Complex Assemblies Faster and at Less Cost with General Electric Furnace Brazing

Two or more metals can be joined, as in the bellows housing shown above. The steel flange is furnace-brazed to a brass shell, using preplaced rings of silver brazing alloy. The desirable qualities of each metal are retained.

General Electric furnace brazing speeds production of really "tough" assemblies—and often does it at less cost than you can do it by your present methods.

For example, here are three types of work where you can improve production with furnace brazing.

You can make complex assemblies from already formed components, and save both material and machine costs.

You can make assemblies of two or more different alloys without changing the desirable characteristics of either.

You can join thin sections to heavy sections without sacrificing strength or inducing local distortion.

These characteristics of furnace brazing can be used in a number of widely different production setups. And General Electric's complete line of furnaces and associated equipment lets you pick the proper furnace to introduce furnace brazing into your particular setup—economically, efficiently.

Cost reductions are typical with furnace brazing because labor content per assembly goes down while output goes up. Waste is reduced since assemblies can be built up of components instead of being machined from solid stock. Uniformity of results frequently leads to reduced inspection costs.

Improved products are the rule with furnace brazing. Life of assemblies is increased because joints have high strength, resist vibration and impact, and are uniformly tight. Assemblies show little or no distortion, since they are free from localized strains. They present a good finished appearance without afterwork because the brazing alloy forms neat fillets. Also protective furnace atmospheres eliminate formation of oxides and do away with the need for flux in most cases.

Increased production over other joining methods is possible, since many joints can be brazed simultaneously. Furnace brazing is adaptable to continuous production, with increasing output.

For a careful analysis of your furnace brazing needs call your General Electric Heating Specialist. Ask him to show you how you can benefit by using furnace brazing. You can reach him at your local General Electric Apparatus Sales Office. If you prefer, send in coupon below for bulletins describing furnace brazing operations and equipment.

Development work is done in this General Electric box furnace, which could also be used for job-lot production. Low in first cost, General Electric box furnaces need little maintenance.

GENERAL ELECTRIC

FREE PROCESS BULLETINS

Section D 721-8,
General Electric Company
Schenectady 5, New York

Please send me free bulletins checked below.

MODERN HEAT PROCESSING BULLETINS

- ☐ Furnace and Induction Brazing, GEA-5889
- ☐ Protective Atmospheres, GEA-5907

TECHNICAL BULLETINS

- ☐ How and Where to Use Furnace Brazing, GEA-3193
- ☐ Electric Furnace Brazing, GER-106
- ☐ Furnace Brazing of Machine Parts, GER-339

NAME ....

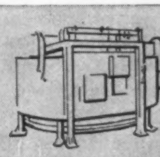
COMPANY ....

ADDRESS ....

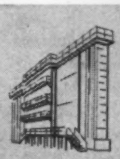
CITY .... STATE ....

OK FOR BRAZING

Mesh Belt



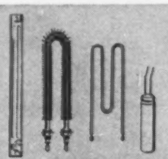
Rotary Hearth



Tower

OK FOR BRAZING

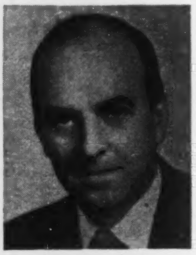
Cylindrical Bell



Metal-sheath

OK FOR BRAZING

Electronic Induction



BYRON B. BELDEN
Application Engineer, Hamilton Div.
Baldwin-Lima-Hamilton Corp.
Hamilton, O.

W. NAUJOKS
Manager of Engineering
Kropp Forge Co.
Chicago

C. H. SMITH JR.
President
Steel Improvement & Forge Co.
Cleveland

J. E. HAWKING
Sales Manager
Pines Engineering Co. Inc.
Aurora, Ill.

industry, we have just introduced two new presses, a 500-ton fully hydraulic, and a 30-ton mechanical. Both provide rigidity and accurate guiding and allow the use of simple die sets.

During the coming year, we will continue our development of presses for the powdered metal industry and will introduce a new 60-ton mechanical press.

We will also introduce a special annular load cell device which will make it possible to accurately measure and record ejection forces on a production machine. This load cell may also be used to insure that equal pressure is being applied by both the bottom and top punches.

Mr. Naujoks . . .

Development of many new highly alloyed forging compositions, usually designed for specialized service requirements, has tended to overshadow the use and importance of the old reliable compositions which still serve a major portion of the needs of metalworking.

The standard carbon and structural alloys still handle the major forging needs in important industries, such as automotive, agricultural equipment, road building machinery, machine tool, engine and power, oil field equipment, railroad, marine and ordnance. The standard compositions tend to offer the best balance of reliability, economy and availability.

Improvements in forging design, forging techniques, heat treatment and surface condition have aided in extending the usefulness of the standard compositions while maintaining their economy and availability. The glitter and glamor of the many new forging alloys should not cause designers to overlook the familiar compositions in their current product designs.

Mr. Smith . . .

Titanium forgings have found a volume use in gas turbine engines.

A substantial number of forged titanium airframe parts will be on a production basis this year.

Manufacturers and the drop forging industry are increasing efforts to develop forging techniques that will permit close tolerances with minimum draft to keep machining at a minimum.

This year, progress will be made in the use of high strength alloy steels with tensile strengths in the neighborhood of 280,000 psi. We are approaching an era when some of the rare metals will find a place in forging. Experimental work on the forging of zirconium, columbium, lithium, tantalum, molybdenum and similar metals will be continued this year.

Mr. Hawking . . .

Bending machinery is becoming more complex as operations are combined in special machines to eliminate handling between operations. One bend at a time was standard in 1956; machines will be making two bends simultaneously in 1957.

In 1956, the use of tube bending machines for automotive frames first became public, although they had been in production since 1954. The years immediately ahead will see still greater advantages in the bending of tubular automotive frames.

Fantastic developments of the aircraft industry continue to influence design of tube bending machines, and 1957 will see precision bending of tube sizes heretofore undreamed of.

Development of the tube bending machine as a precision machine tool has not been confined to tubing. Automotive, farm equipment and road building machinery manufacturers have begun to employ this technique as a cost saving tool, and 1957 will see wider use of bending machines. They'll handle bars, rolled steel sections, extrusions and formed sheet metal.

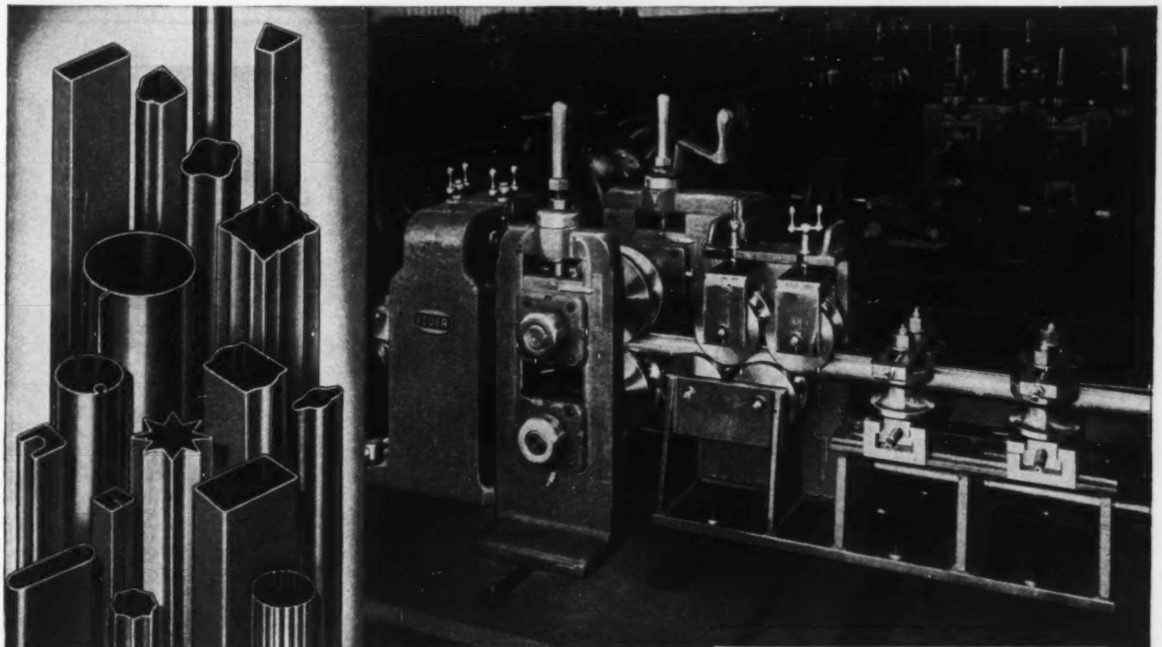
Mr. Van Deusen . . .

Increasing use of expensive, complex tooling such as progressive carbide dies, and the tendency toward the use of stampings as a replacement for castings and forgings have caused the press to become one of the most important pieces of equipment in metalworking.

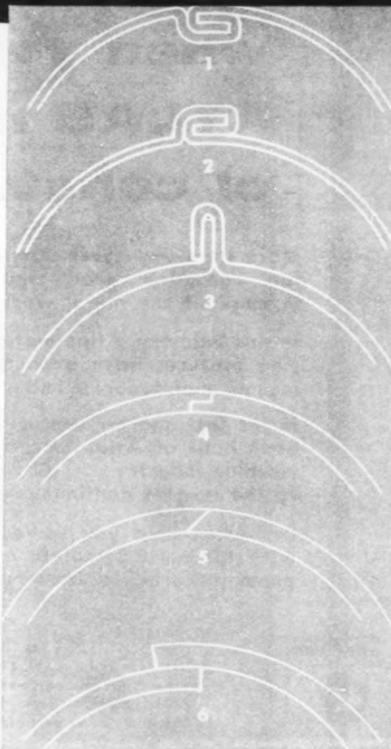
With widened use of the press has come a demand for machines which will simplify operations and conserve floor space. Add improved accuracy and operating economies, and you have the modern press, which approaches a self-contained production unit. Increased die life, elimination of between-operation-handling, rapidity of die change and completeness of production have become major considerations in the press shop.

To meet these demands, the progressive press manufacturer has been re-evaluating his designs, and, where necessary, creating new ones. Today, the keyword in press design is "ingenuity."

Engineering departments have become as important as sales departments in selling a press.



Lock-Seaming attachment at exit end of forming machine.



COLD ROLL FORMING TUBULAR SHAPES

Among the wide variety of things you can make on a Yoder Cold Roll Forming machine are round, square, oval, rectangular and other tubular shapes, such as illustrated at left above. The seams may be open, lapped, butted, dovetailed, interlocking, etc.—as indicated in Figures 1 to 6 at the right.

Millions of feet of such unwelded tubular shapes are made from coiled strip for conductor pipe, bedsteads, lamp stands, window channel, wiring raceways, carrying rods, etc. Production ranges from 20,000 to 50,000 feet per day, with only one operator and a helper.

Yoder offers you the cooperation of their engineering staff for designing and adapting their cold roll forming machines, auxiliaries, and tooling, for the low cost production of structurals, mouldings and trim, panels, tubular and other shapes, to meet individual needs.

The Yoder book on Cold Roll Forming is a complete, illustrated text on the art and the equipment needed for performing a variety of operations which can be combined with cold roll forming, at little or no extra labor cost. A copy is yours for the asking.

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MANUFACTURING

COLD ROLL FORMING MACHINES

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PIPE AND TUBE MILLS—Electric Weld

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corrosion
problems
solved

when you use
ATLAS materials
of construction

More than any other, the name, ATLAS, is specified for corrosion proof materials of construction throughout the metal working industry.

In this industry, Atlas materials, engineering and design features have accounted for tremendous savings in maintenance and replacements.

In the last quarter century, thousands of tanks have been built of Atlas materials for use by the metal working industry . . . all types, from small dip tanks to the largest continuous picklers.

Let Atlas help you solve your corrosion problems with the most complete available line of corrosion proof materials of construction in the country.

Atlas provides a complete corrosion service from on-the-spot technical advice through engineering design to complete construction facilities to carry the job from beginning to end.

- CEMENTS
- COATINGS
- LININGS
- RIGID PLASTICS

ATLAS MINERAL
PRODUCTS COMPANY
MERTZTOWN, PENNSYLVANIA

Write for Bulletin CC#3 giving informative data on the complete Atlas line.

NEIL VAN DEUSEN
General Sales Manager, Henry & Wright
and V & O Press Co. Div.
Emhart Mfg. Co., Hartford, Conn.

CARL J. PFEIFER
President
National Cored Forgings Co. Inc.
South Norwalk, Conn.

Typical of such efforts is the increasing flexibility of V & O presses. Design modifications and attachments have changed a conventional press from a simple unit for single-stage stamping to a multi-operations machine accomplishing primary and secondary operations without material handling between stages.

Early this year our Henry & Wright division announced a double crank dieing machine which presents a new concept in press working. Its immediate acceptance shows the anxiousness of the metalworking industry to adopt ideas which contribute to more efficient, economical production.

Mr. Pfeifer . . .

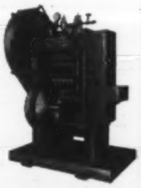
It behooves everyone in the forging industry to seek savings in initial material costs, as well as in subsequent machining operations. We believe we have a method (cored forging) which reasonably meets both conditions for forgings which weigh under 20 lb.

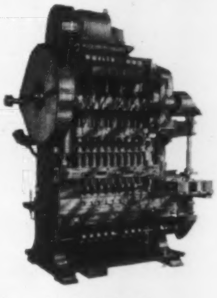
Four materials have been handled successfully — aluminum, brass, bronze and copper. Many suitable alloys are in the development stage, and the trend toward stainless steels, titanium and other forgeable alloys is being pursued.

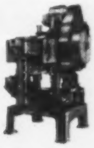
For Automation In Pressworking

THINK OF WATERBURY FARREL

WATERBURY FOUNDED 1851 FARREL


"Waterbury" Transfer Presses

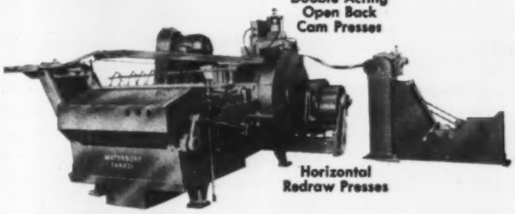

Cam and Crank Eyelet Machines

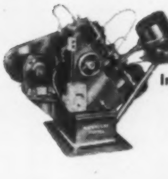

Four Post Blanking Presses

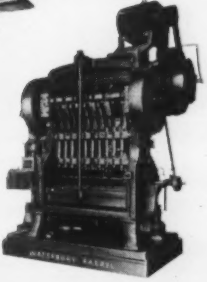
High Speed Blankers

Single Acting Open Back Bench Presses

Double Acting Open Back Cam Presses


Horizontal Redraw Presses


Inclined Shell Threaders


Multiple Plunger Pillar Presses

Waterbury Farrel's extraordinary range of press-building experience encompasses a wide variety of single and multiple operation presses. These include virtually every commercial type up to 600 ton capacity.
In addition, Waterbury Farrel has successfully engineered automated press output by combining presses, feeds, hoppers, straighteners, coil holders, scrap choppers, scrap winders, finger motions, attachments for side piercing, blank turning, stripper release, and blank holding mechanisms into production-team units.

Write for free catalogs on specific types of presses or contact your nearest Waterbury Farrel office today.

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COLLAPSIBLE TUBE EQUIPMENT
Knuckle Joint Presses
Tube Cap Machinery
Tube Trimming Lathes

HIGH SPEED PRESSES
Two Post Blanking
Four Post Blanking

MULTIPLE STATION MACHINES
Cam Eyelet
Crank Eyelet
Multiple Plunger
Pillar Presses
Transfer Presses
Horizontal Redraw Presses

OPEN BACK PRESSES
Double Acting Cam
Double Acting Crank
Geared
Single Acting Crank

PILLAR PRESSES
Double Acting Cam
Double Acting Crank
Geared Pillar
Single Acting Crank

SMALL PRESSES
Foot
Hand
Safety Bench
Single Acting
Open Back Bench

SINGLE AND DOUBLE GEARED ARCH DRAWING PRESSES

THREADERS
Inclined Shell Threaders
Screw Cap Thread Rolling Machines

MINT COINING PRESSES

LATHES
Edging, Trimming and Knurling Lathes

AMMUNITION AND CARTRIDGE MACHINERY
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MISCELLANEOUS
Coil Holders
Coil Holders and Roll Straightener Units
Roll Straighteners
Unwinding Device
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WF-34

Bolt, Nut & Screw Machinery · Power Presses · Rolling Mill Machinery · Wire Mill Equipment · Sendzimir Mills and other Special Machinery

WATERBURY FOUNDED 1851 FARREL

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P. R. HENDRIXSON
Electrochemicals Dept., E. I. du Pont
de Nemours & Co., Wilmington, Del.

W. R. MEYER
President
Enthone Inc., New Haven, Conn.

CLEANING AND FINISHING

FORUM ON TECHNICAL PROGRESS

Nickel supply for plating should improve . . . anodized aluminum growing fast . . . more plating is being tied in with the production line . . . new phosphating processes show up . . . more durable paint coatings are available . . .

Mr. Saltonstall . . .

Availability of nickel anodes for plating continues to be the greatest concern to manufacturers who are using or would like to use nickel-chromium as a protective and decorative coating. There are so many "ifs" with regard to government action that it is impossible to make a prediction. But the possibility of appreciable improvement in the quantity of nickel available for civilian industry is definitely brighter than it was at this time last year.

A new stable antispray material for chromium plating and other electrochemical processes has been announced. It provides economy of operation and improves working conditions.

Automation in plating will continue to increase at a steady pace. A specific trend will be the accelerated use of automatic machines for large parts, such as automotive bumpers, and small parts which can be satisfactorily plated in automatic barrel machines.

Mr. Gaarder . . .

Application procedures are changing rapidly. The move is toward faster finishing schedules and more economical methods of putting on the coating. In many cases, the reduction of material losses has more than offset the higher cost of finishes. The user is able to upgrade his product finish at no increase in cost.

Research in organic finishes, particularly the resins, indicates that we can look for many improvements in the near future. But as we get into these more complex finishes, more attention must be given to surface preparation if we are to benefit by their use. Generally, the more complex organic coatings are more vulnerable to oil deposits and other foreign material and require a chemical surface treatment which insures cleanliness.

Mr. Hendrixson . . .

Consumption of trichlorethylene for metal cleaning last year probably did not exceed 1955's 275 million lb by more than 10 per cent, but the increase in work processed was undoubtedly much greater. The reason: Improved economies realized by consumers, largely through the increasing use of conveyorized equipment.

Conveyorized and canopied equipment operating at near capacity on a multishift basis can hold solvent costs to between ½ and 1 gallon per ton of work—depending on the nature of the parts. Manual units may consume 20 to 40 per cent more solvent, largely because of less positive draft control and less uniformity in the rate of work throughput.

Modern antisludging trichlorethylenes, together with effective solvent recovery, have greatly diminished the importance of solvent costs where vapor degreasing is used in efficient equipment.

Mr. Meyer . . .

A new alkaline cleaner for zinc base diecastings is available which prevents attack during cleaning; a companion acid dip prevents overetching. The combination of the two prevents blistering and peeling of plated finishes.

A new process for treating zinc surfaces, including zinc plate and die-cast zinc, gives black finishes with a high degree of adhesion to withstand bending of the part. In addition, the coating has high temperature resistance. A process is available to give blue-black, shiny finishes on brasses and brown shades on copper and copper base alloys, including brasses.

The tarnishing of copper and

C. F. NIXON
Head, Electrochemistry Dept.
Research Staff, General Motors
Corp., Detroit

M. B. DIGGIN
Vice President & Technical Director
Hanson-Van Winkle-Munning Co.
Matawan, N. J.

WILLIAM P. INNES
Technical Director, MacDermid Inc.
Waterbury, Conn.

HAROLD P. RANSBURG
Vice President
Ransburg Electro-Coating Corp.
Indianapolis

brass when they are subjected to high humidity has been alleviated to a great degree by a product used in water solution. The object to be inhibited from tarnishing is dried when it comes from the solution. No visible coating is left.

New alkaline products for removal of rust and scale were added to our line of alkaline rust and scale removers.

Mr. Nixon . . .

Two factors will influence technical developments in automotive plating: First, the desire for improved corrosion resistance of plated parts used on car exteriors. Second, the desire for durable plating less dependent upon nickel.

Under the sponsorship of the American Society for Testing Materials and the American Electroplaters' Society, joint industry studies on the problems of improving the outdoor durability of decorative plating are being made. Progress is also being made in the development of a reliable accelerated weathering test (AES Research Project 15). When it is available, the effects of solution and procedural changes on durability can be ascertained within a week instead of one or two years.

Since no simple metal has been found to be capable of replacing nickel, increasing attention is being given the possibility that its purpose may be served with an alloy deposit. More attention will be given to copper plating. Thicker copper deposits allow thinner nickel within specification limits—especially in the case of zinc base diecastings. The use of anodized aluminum parts (partly to conserve nickel) is likely to increase.

Mr. Diggin . . .

One of the most significant trends of the past year was the increased use of processed aluminum for automotive trim, household appliances and architectural purposes. A variety of surface finishes are being applied. Anodizing produces a hard protective coating which in many cases is colorstyled by dyeing. New automation techniques make it possible to produce different colors on a single anodizing conveyor.

The processing of continuous aluminum strip and wire (involving cleaning, etching and anodizing) is increasing. New techniques make it possible to form articles from strip after anodizing and dyeing.

Automatic loaders and unloaders are being used with full automatic plating conveyors. The tying in of the plating machine with plant conveyors promotes a smoother flow of work and saves labor costs. The deciding factor in adopting such systems in many cases is that plating racks carry such heavy loads that it is impossible to handle them manually.

Mr. Innes . . .

Successful operation of bright, high-speed electroplating processes depends on the control (or elimination) of contaminants. Chromium and certain organic contamination are particularly troublesome in bright cyanide copper plating.

We have recently perfected two methods of handling chromium in both sulphur type and sulphur-free bright cyanide copper plating solutions. One precipitates the chromium, which is removed by filtration. The other requires no filtration and uses a chelating agent which ties up the chromium chemically. This chelating agent, Metex CR3, eliminates the effect of the chromium on the copper deposit without producing any side effects (staining, pitting and etching) and does not interfere with brightening. To handle organic contamination, a line of "Non Pitters" has been developed for bright cyanide copper solutions.

Research has resulted in a new concept in the preparation of metal for electroplating. A new material replaces the pickle or acid dip in the plating cycle. Called Metex Acid Salt M-629, it combines acid salts, activators and surfactants and results in brighter work without increasing the thickness of the plate.

Mr. Ransburg . . .

Improvements in equipment and techniques are enabling electrostatic painting to better meet industry's requirements. The No. 2 process (disc-type airless atomizer) has proved to be just as efficient and in many cases more flexible than the bell type.

Our engineers have developed a high voltage system which is remarkably free of shock and fire hazards and quite portable. We hope to start supplying our customers with a voltage pack the size of a 7-gallon can in 1957.

We are developing an electrostatic hand gun. Results are most encouraging. Though it may be some time

A. E. CARPENTER
Chairman
E. F. Houghton & Co., Philadelphia

H. L. KELLNER
Technical Director
Lea Mfg. Co., Waterbury, Conn.

C. L. FAUST
Battelle Memorial Institute
Columbus, O.

E. J. ROEHL
Manager, Technical Development, Thomas
Strip Div., Pittsburgh Steel Co.
Warren, O.

before it is available, we have demonstrated that it is a flexible tool with broad application.

In collaboration with the G. E. Appliance Park Home Laundry Department and suppliers of frit, we have developed equipment for the application of porcelain enamel. Four of our units have been doing a good job in production for almost two years. Results achieved are high efficiency, a substantial reduction in film thickness and reduced rejects due to improved control and film uniformity. Several improvements of this equipment were incorporated into eight units installed at Whirlpool-Seeger in 1956. This development will gain real momentum in the porcelain field in 1957.

Mr. Carpenter . . .

New developments in metal cleaning and finishing come under four general headings: Acidic cleaning, ultrasonic cleaning, barrel tumbling aids and phosphating.

Acidic cleaning is done with a dry powder added to hot water. One operation does what formerly was divided into three stages—alkaline cleaner, pickle and a second alkaline bath. Our powdered acid cleaner is an inhibited acid, highly fortified with detergent and wetting agent.

The efficiency of ultrasonic cleaning is increased when a mild detergent is added to the solution. Barrel tumbling aids are soaps and detergents particularly developed for this type of finishing. They are used with and without abrasives. In phosphating, the tendency seems to be toward the use of dip-type materials for zinc or iron phosphate coatings. Greater use of phosphating as an aid in cold extrusion is expected.

Mr. Kellner . . .

In buffing and polishing, the spotlight is on automation. Proper contact of the buffing wheel with the surface being buffed—more difficult to attain automatically than manually, is essential in abrasive finishing. The flexibility of fast cutting buffs helps to insure proper contact. Also, the improvement of liquid abrasive buffing compositions and the perfection of spray equipment and mechanical buffing bar applicators will enlarge the scope of automatic buffing.

Polishing wheels made of coated abrasive cloth assist automation. In many cases, they combine the fast cutting of polishing with flexibility.

The contour of the article is important in selecting buffing and polishing equipment. A slight change in design will often allow an automatic operation to replace a manual one. It is essential that designers, product engineers and finishing supervisors co-operate closely to simplify mechanical abrasive finishing problems.

Mr. Faust . . .

The need for resistance to oxidation and corrosion at high temperatures is changing metal finishing technology. High temperature properties of electroplates and metallic coatings applied by other methods will be studied for aerodynamic uses. Multilayer and alloy coatings will be needed for control of detrimental diffusion. Studies on the protection of molybdenum indicate that a gold-chromium alloy under nickel does the job.

The method of preparation of the basic metal surface is important in determining the properties and performance of metals at high temperature.

Nonmetallic coatings that have resistance to thermal shock and impact are needed. Metallic and nonmetallic coatings will provide for reflection or absorption of heat or other types of energy.

The growing interest in machining steels of 200,000 psi and higher emphasizes the need for nonmechanical methods that avoid damaging surface stresses. Also, the fear of hydrogen embrittlement during surface preparation and electroplating is directing interest to metallic and nonmetallic coatings by vacuum evaporation and vapor phase processes.

Mr. Roehl . . .

The use of brass coated steel is increasing. Other electrolytic alloy coatings, such as lead-tin, are available for specific requirements. This field will expand.

Interest is developing in steel which is precoated by phosphating and lubricated. This treatment pro-

(Advertisement)

SPECIAL REPORTS ON FINISHING NON-FERROUS METALS

NUMBER III—Lustrous, Corrosion-Resistant Finishing with Chemical Polishing Iridite

WHAT IS IRIDITE®?

Briefly, Iridite is the tradename for a specialized line of chromate conversion finishes. They are generally applied by dip, some by brush or spray, at or near room temperature, with automatic equipment or manual finishing facilities. During application, a chemical reaction occurs that produces a thin (.00002" max.) gel-like, complex chromate film of a non-porous nature on the surface of the metal. This film is an integral part of the metal itself, thus cannot flake, chip or peel. No special equipment, exhaust systems or specially trained personnel are required.

Chromate conversion coatings are widely accepted throughout industry as an economical means of providing corrosion protection, a good base for paint and decorative finishes for non-ferrous metals. Certain of these coatings also possess chemical polishing abilities that have luster-producing, as well as corrosion-inhibiting, effects on zinc and cadmium plate, zinc die castings and copper alloys. However, continued developments in this field have been so rapid that many manufacturers may not be completely aware of the breadth of application of this type of finish. Hence, this discussion of the many ways in which this chemical polishing characteristic can be used in final finishing or pre-plating treatments to produce a lustrous appearance with distinct display and sales appeal and appreciable savings in cost. Report I on decorative, corrosion-resistant finishes and Report II on paint base corrosion-resistant finishes are available on request.

The degree of luster possible on a surface is a function of the degree to which the surface can be smoothed. Leveling to provide a smooth surface can be achieved by mechanical or chemical means, or a combination of these, depending upon the luster desired and the original condition of the metal. Chemical polishing effectively imparts luster otherwise difficult and costly to obtain. For this reason, it is often used to supplement or entirely replace mechanical polishing, depending upon the application and the original condition of the metal. Chemical polishing has the additional advantage of providing overall treatment of the submerged part. It reaches into even the deepest corners and recesses that are otherwise inaccessible. Certain of the Iridites are specifically designed to perform this chemical polishing operation. Also, they provide corrosion protection as do all Iridites, thus may be used as a final finish or a pre-plating polish.

If Iridite is to be used as a final finish, in contrast to pre-plating treatment, the chromate conversion coating generated is allowed to remain, providing good corrosion resistance. Color inherent in these Iridite films ranges from a yellow cast to yellow iridescent. These coatings may be used without further treatment where this color is acceptable and good corrosion resistance is desired. Further, these basic coatings can be tinted by dyeing. Among the dye tints available are shades of red, yellow, blue and green. If desirable, the basic coatings can also be modified by a bleach dip leaving a clear bright or blue iridescent finish. In all cases bleaching reduces corrosion resistance.

As examples of this type of final finishing, Iridites #4-73 and #4-75 (Cast-Zinc-Brite) make possible for the first time, lustrous chemical polishing of the as-cast surface of zinc die castings. Thus, in many cases, sizeable savings in finishing cost are realized by elimination of plating costs. This economical method can be used on tools, appliance parts, toy pistols, locks and many other small castings. Another example is the treatment of copper and brass parts, such as welding tips, to eliminate buffing and provide additional corrosion resistance. In many cases, handling costs are reduced appreciably by replacing piece-part handling with bulk processing. Still another example of the use of this chemical polishing and protective quality of Iridite is a simple system of zinc plate, Iridite and clear lacquer instead of more costly electroplated finishes. Typical of this type of lustrous finish are builders hardware and wire goods.

As a pre-plating treatment, in contrast to final finishes, Iridite can be used to chemically polish zinc die castings or copper prior to plating. In such cases, Iridite should be applied as an in-process step, so that the protective film is removed before the plating cycle. The savings in handling, material and labor costs are obvious. This process has made it practical to plate chrome directly over copper on steel, conserving nickel, yet producing a lustrous chrome finish. Used after stripping faulty plate in reprocessing zinc die castings, Iridite restores luster to the casting, thus making possible replating without blistering.

Other Iridite finishes are available to produce maximum corrosion resistance, a wide variety of decorative finishes and excellent bases for paint on all commercial forms of the more commonly used non-ferrous metals. As a final finish, appearance ranges from clear bright to olive drab and brown and many films can be bleached or dyed. As a paint base Iridite provides excellent initial and retentive paint adhesion and a self-healing property which protects bare metal if exposed by scratching. Iridites have low electrical resistance. Some can be soldered and welded. The Iridite film itself does not affect the dimensional stability of close tolerance parts.

Iridites are widely approved under both Armed Services and industrial specifications because of their top performance, low cost and savings of materials and equipment.

You can see then, that with the many factors to be considered, selection of the Iridite best suited to your product demands the services of a specialist. That's why Allied maintains a staff of competent Field Engineers—to help you select the Iridite to make your installation most efficient in improving the quality of your product. You'll find your Allied Field Engineer listed under "Plating Supplies" in your classified telephone book. Or, write direct and tell us your problem. Complete literature and data, as well as sample part processing, is available. Allied Research Products, Inc., 4004-06 East Monument Street, Baltimore 5, Maryland.

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Vice President
Glidden Co., Cleveland

tects and lubricates bright finished surfaces during manufacturing and handling.

Steels precoated with printed or embossed polyvinyl chloride films, Mylar and other plastics offer new possibilities in decorative and functional uses.

Recent developments in hot dipped aluminum coated steel have improved the prospects of this material. Aluminum clad steel is available, and there is interest in the production of continuous steel strip, which is coated electrolytically with aluminum.

Mr. Roche . . .

Important to ceramic spraying is the development of a material regulator. It accurately controls the flow and fluid pressure of porcelain enamel and ceramic glazes. It's the key to providing the advantages of a circulating system, which up to now has been a handicap to better enameling.

Of equal importance to paint spraying is an agitator type, siphon cup for spray guns. It was developed because of the increased use of paints which require constant agitation. Failure to spray properly mixed materials causes offcolor rejects. This new agitator siphon cup assures the proper mixture for smooth, uniform finishing.

Mr. Kramer . . .

Cleaning compositions are undergoing simplification through the selection of the type and quantity of ingredients on the basis of their specific function. This is possible because results of basic studies of detergency mechanisms require less reliance on the empirical approaches employed in the past. More economical products with more predictable performance have resulted.

The development of new surfactants, chelating agents, solvents and other chemicals will enable a continuing upgrading of proprietary products and overcome limitations of conventional materials used in the past.

New metals in many cases need special cleaning techniques. Progress in organic coatings is requiring reevaluation of methods for surface preparation and of ways to remove the finish.

Mr. March . . .

A new form of coated abrasive (it has hundreds of radially disposed and compressed abrasive leaves) is showing great promise in finishing. In experiments with nonferrous mills and makers of high carbon strip, this "PG" (polishing and grinding) wheel is being used to remove scallops and fire lines and generally upgrade copper and brass strip. Makers of stainless and high carbon strip are using it to remove annealing oxides and light scale.

Other applications of "PG" wheels include automatic polishing of formed metal parts prior to plating and as a follow-up on shotblasted strip and sheets. Intermittent polishing of mill rolls in the rolling of luster strip will be tried experimentally.

For the first time, here is a coated abrasive product not simply adaptable to automatics—it was designed for them.

Mr. Huldrum . . .

Epoxy coatings are finding wider application. Research has produced protective and decorative finishes made from these resins that offer durability, and resistance to chemicals, moisture, weathering, salt spray and wear.

Until recently, phenolic plastics were molded in black because there was no method to color them. Today, they can be coated with epoxy finishes in an unlimited range.

This year, more than half the output of beer cans of one corporation (nearly 4 billion), will be coated with an epoxy primer. It will protect the beverage against contamination caused by contact with the metal container.

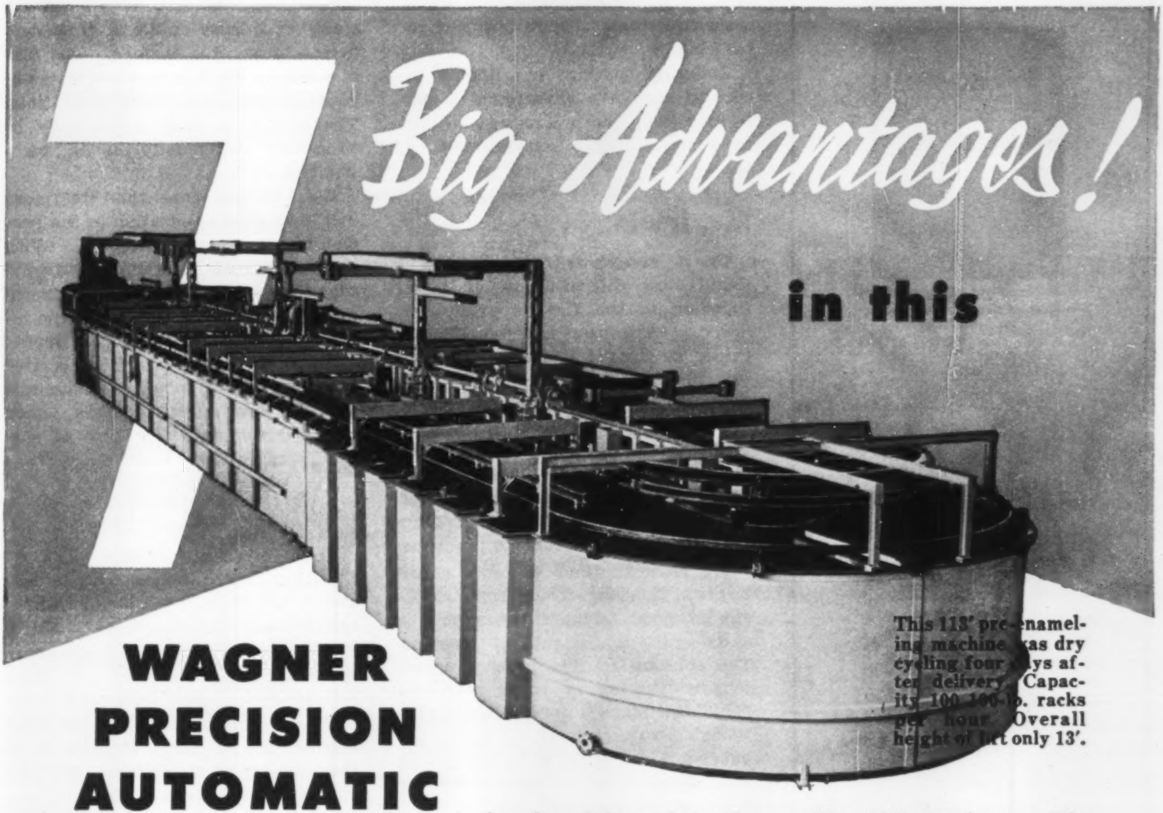
Mr. Duncan . . .

The paint industry is moving ahead in the development of new chemical coatings which extend the service life of fabricated steel.

For example, a three-coat catalyzed finishing system is available for the lining of pipes and storage tanks where salt water, hydrogen sulphide and solvent resistance are important. It extends the life of sour crude pipelines from about two to eight years.

Another development is an alkali resistant car coating which is the forerunner of a line of highly corrosion and chemical resistant tank lin-

7 Big Advantages! in this



This 113' pre-enameling machine was dry cycling four days after delivery. Capacity 100 100-lb. racks per hour. Overall height of lift only 13'.

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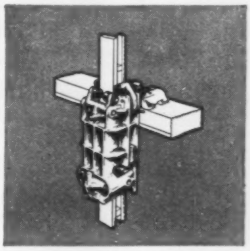
This modular precision electroplating machine is a big subject. Please send for our technical bulletin, learn all the facts, compare—or call the Wagner Man in your area. He'll study your problems and help you achieve better plating at lower costs.

Any day of the week you'll see us lift a 3200 pound automobile with the elevating mechanism of our standard automatic plating machine. That's just to dramatize the dynamic lift capacity of our modular type machine. This excessive capacity simply means that deflection under normal loads is minimum, thus strain on alignment mechanisms is eliminated, wear and downtime is reduced to the vanishing point. Your own personnel—any mechanic—can make precision adjustments of critical transfer members, including the main lift boom, carrier lift angle assemblies and carrier rail support brackets. Maintenance is simple as standard gear racks and pinions are used throughout the entire elevator mechanism (altho capacity can be increased 50% by substituting our heavy duty rack). Hardened guide rollers have positive lubrication—or central lubrication may be installed at low cost.

Here's how you get low cost installation and servicing, even later alterations. All details are interchangeable, precision drilled and machined, preassembled. Our modular design permits easy lengthening or shortening for long term production changes; parts, assemblies, even sections may be replaced. Every part is drilled, reamed, tapped and milled in special co-ordinated fixtures; sections are assembled in giant jigs for fool-proof self-aligning. A single hydraulic power unit interconnected to two hydromotors with micro adjustment of acceleration and deceleration permits work carriers to be lifted, transferred and deposited gently without jarring or loss of parts.



Typical pre-assembled single station elevator housing ready for bolting through jig-drilled holes in main carriage. Note adjustable roller guide brackets.

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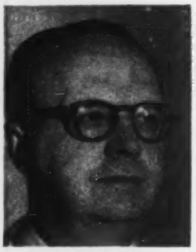

R. C. GIBSON
Asst. Vice President
Parker Rust Proof Co., Detroit

T. J. KEARNEY
Asst. Manager, Industrial Equipment Div., Detrex Chemical Industries Inc.
Detroit

STUART J. SWENSSON
Secretary, American Hot Dip Galvanizers Assn. Inc., Pittsburgh

ings. It keeps cars in service which otherwise would require frequent repainting.

Emulsion coatings are finding increased use. We have found a way to give them the protective and decorative qualities of oil enamels.

Mr. Irwin . . .

On a recent trip to Europe, I found that the progress of metal finishing in the U.S. is avidly followed by European industry. This is evidenced by the increasing activity to license American processes to catch up on European losses due to World War II.

Compared with Europe's, our problems are not quite so complex. European manufacturers must catch up with what has been done and try to keep abreast of current problems.

We must continue to forge ahead in metal finishing. The chronic shortage of good technical know-how is a deterrent to the rate of progress. The solution to this problem is intensive training of young technical personnel. Manufacturers should plan finishing requirements as far in advance as possible, so personnel can be trained and the answers will be ready at the right time.

Mr. Lum . . .

Increasing costs make it necessary to minimize hand labor and reduce material loss through rejects. Both have brought about a demand for more positive cleaning cycles and specialized cleaners designed to meet the requirements of a given cycle.

They will often be required to perform a dual function—such as giving a degree of rust protection or activating the surface for subsequent treatments.

Much work will be done on the general improvement of cleaners, through the combination of surfactants and emulsifiers, to produce a synergistic effect. Considerable attention will be given to the development of milder and slightly acid cleaners.

Mr. Gibson . . .

A new surface treatment for steel, zinc, aluminum, brass and magnesium strip or sheets, provides greatly improved bare corrosion resistance. The adhesion and durability of paint finishes are comparable to those with conventional surface preparations.

After the metal surface is cleaned, the aqueous solution is applied by spray or immersion for a time sufficient to wet the surface. The film is cured by heating at a slightly elevated temperature for a short time. The metals or their alloys may be processed individually or in combination.

It's expected that this treatment will have wide application in the production of metal containers. With the emergence of the tinless and solderless can, it will eliminate, in many cases, the need to paint the inside and outside of the container—except for labeling and decorative purposes. Metal venetian blinds and awnings are other products which are well suited to this type of surface preparation.

Mr. Kearney . . .

Rationalized automation, with balanced emphasis on all operations, seems to be gaining favor. Automated washing, degreasing and other metal finishing processes are being incorporated in new production lines.

Because orientation and drainage position are of prime importance in the cleaning of metal parts, the personnel responsible for cleaning and quality control must be consulted so a quality product can be made economically. This approach seems to have gained stature and will continue to be the thinking in process engineering.

Mr. Swensson . . .

Prospects for hot dip galvanizing this year are excellent. The facilities of the job galvanizers are ample for the demands which will be made upon them.

There are two major reasons why hot dip galvanizers expect full operations in 1957: First, the steel industry looks for a full capacity year. As usual, a generous percentage of the tonnage will need galvanizing to protect against rust. Second, the ultimate consumer will pay more for iron and steel items than ever before. Protection with heavy zinc coatings will be even more valuable.

Mr. Sorensen . . .

An important development is rapid phosphate treatment of "Wheelabraded" steel to improve paint adherence and corrosion resistance. The unique feature is that the steel is in contact with the phosphatizing solution for only 15 seconds, yet coating weights

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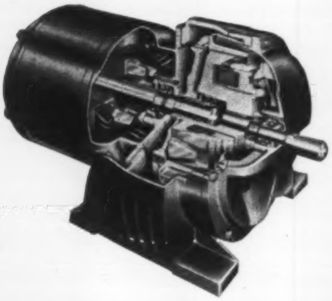
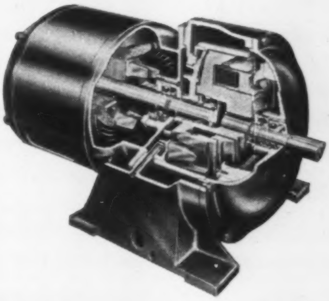


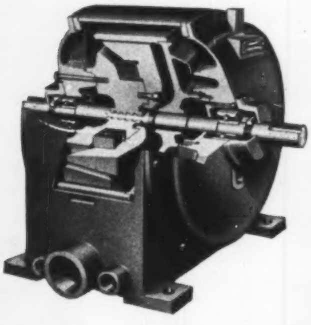
Ajusto-Spede® Drives

Dynamatic Ajusto-Spede® Drives supply infinitely adjustable speed from an AC power source—with low power losses and minimum maintenance. These air-cooled, stationary field, eddy-current couplings, integrally mounted with standard D-flange AC induction motors, provide a complete package-drive in sizes from 3 HP to 75 HP. Units of the same design and capacities are also available without motors.

Dynaspede® Drives

These Dynamatic liquid-cooled, adjustable speed, Eddy-Current Couplings, integrally mounted with standard D-flange AC induction motors provide a compact self-contained drive in sizes from 3 HP to 75 HP. Motor types available are drip proof, totally enclosed fan cooled, and explosion proof. The coupling is completely enclosed. Separately mounted couplings are also available in capacities from 3 to 2500 HP and larger.



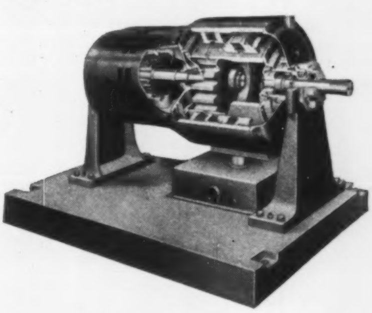


Eddy-Current Brakes

Dynamatic Eddy-Current Brakes are available in a wide range of torque capacities and operating speeds. Features include smooth, frictionless, shock-free operation with no rotating electrical components or contacts. Liquid-cooled types, as illustrated, provide loading requirements from 40 HP to 10,000 HP. Air-cooled units are available in sizes up to 50 HP.

Dynamometers

Three types of Dynamatic Eddy-Current Dynamometers are available to meet various testing requirements; absorption dynamometers up to 15,000 HP; motoring or driving dynamometers up to 500 HP; and universal dynamometers to 500 HP and larger. Special purpose dynamometers are also designed for use in applications where requirements are unusual.



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AT A VERY REASONABLE COST

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COMPLETELY STABLE: It's *completely stable;* it doesn't lose any of its strength during shut downs no matter how long they must be.

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EASE OF CONTROL: It's *easy to control.* With the addition of Zero-Mist H.T.*, a thin foam blanket subsides when current is turned off, but reforms as the bath is again used. This foam blanket provides the simple visible check for efficient operation.

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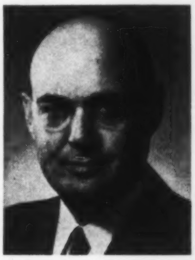
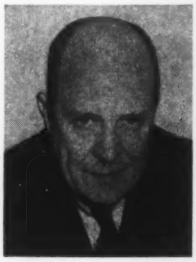


L. C. SORENSEN
President, Kelite Corp.
Los Angeles



J. O. J. SHELLENBERGER
Vice President-Dir. of International
Div., American Chemical Paint Co.
Ambler, Pa.

of 70 to 150 mg/sq ft are achieved.

This process has been applied successfully to coating sheet stock, which is fabricated into drums. It is by-passed through rollers in contact with the treated solution. Besides the advantage of handling the stock in the flat, this process turns out coated steel sheet at 160 fpm.

Mr. Shellenberger . . .

The trend toward specialization which is already well started in the metal finishing industry will continue and is expected to grow in the coming years. New metals and new alloys will require new coatings and new surface treatments to prepare them for painting, or to assist in working them.

We look for expanding business and increased competition. If we wish to serve industry properly, we must custom tailor our service and our developments to suit the specialized needs of our customers.

Mr. Lux . . .

The goal of cleaning material and cleaning machine makers for 1957 is to acquaint more key men in metal-

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New LOW COST GARLOCK MECHANICAL SEAL

has "Gem-like" Qualities!

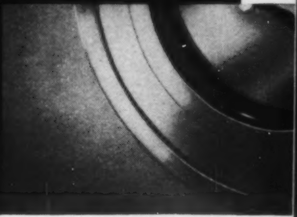
The finest quality materials, design, and workmanship have been incorporated in this new low cost Garlock Mechanical Seal for 5/8″ to 3/4″ diameter shafts.

This new low cost mechanical seal is another important addition to "the Garlock 2,000" . . . two thousand different styles of packings, gaskets, and seals for every need. The only complete line . . . that's why you get unbiased recommendations from your Garlock representative.

True Carbon Seal Ring with precision lapped surface. Regarded by all experts as the finest material for one face of any mechanical seal. Perfectly flat sealing surface contacts stationary seat.

Stationary Seat of finest Ceramic is mounted in a molded cup-shaped vibration ring. Its sealing surface is precisely lapped for perfect contact with the carbon seal ring . . . perfectly matched for positive sealing.

Costly Two-piece Shell Construction. Shell rolls over a retainer ring which holds "O" Ring (static seal) in place and also provides a metal surface which gives you an exact mounting position. No danger of incorrect mounting due to improperly located static seal.



Static "O" Ring in Groove permits mounting seal from either direction without disturbing position in shell. Withstands higher pressures (100 psi.) and permits tighter fits than square shaped rings.

Roll Type Bellows provides greater travel than "V" type bellows.

We invite you to compare this new inexpensive Garlock seal with those you are now using. It is designed for use on any rotating shaft of home water pumps, oil pumps, reduction units, washing machines, etc. Get all the facts, call your local Garlock Representative or write for data sheets on this new mechanical seal.

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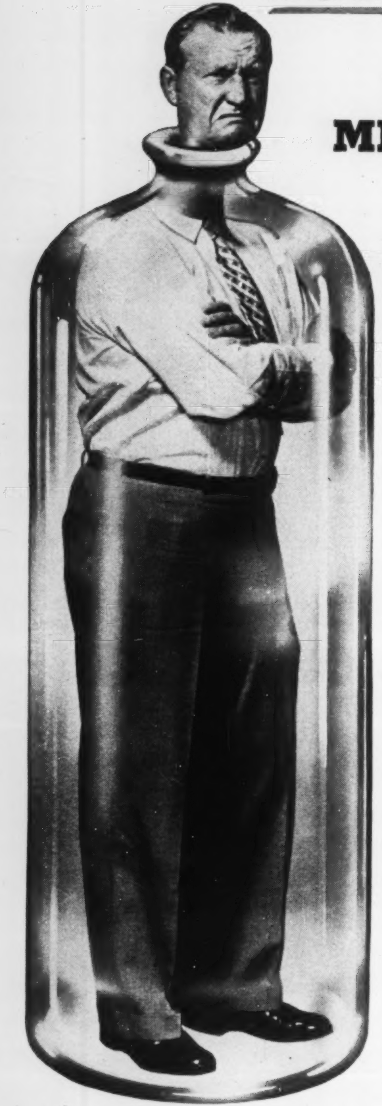

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Are hand-operated metal cleaning operations the bottleneck in your production flow? Are you putting up with the cost and confusion of centralized cleaning operations? Detrex can quickly solve both of these profit-eating conditions by placing your metal cleaning operation in sequence right within your present production lines . . . automated or otherwise.

Whether you need alkaline or emulsion cleaners (dip or spray), solvent degreasing, or fast, hard-scrubbing ultrasonic cleaning, Detrex will provide equipment tailored to your production requirements. Added to this, Detrex also produces the cleaning chemicals for these operations and thus can guarantee performance of the entire operation.

To keep your metal cleaning processes in step with the rest of your production, why not have a talk with your nearest Detrex field technician? Use the coupon below to get the ball rolling today . . . no obligation.

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Technical Education Director
Oakite Products Inc., New York

N. G. BRANSON
President, Branson Ultrasonic Corp.
Stamford, Conn.

working with the need for knowledge of the fundamentals of metal cleaning.

The program of the American Society for Testing Materials (Committee B-8 wrote recommended practices for the preparation of metals for electroplating) is an example of co-operation between manufacturers of cleaning materials and the metalworking industry. Technical staff members of producers, consumers and government agencies pooled their knowledge to guide industry in properly preparing for metal finishing operations.

Mr. Branson . . .

Ultrasonic energy is finding wide application in the cleaning of small parts. The trend is toward large automatic installations.

One of the most serious problems is the lack of satisfactory standards for evaluating the performance of the wide variety of ultrasonic systems available. Members of the new Ultrasonic Manufacturers Association are working on this problem.

Ultrasonics properly applied in a suitable cleaning medium gives a degree of cleanliness that cannot be approached by any method except careful hand scrubbing.

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KX-99 firebrick linings in hot metal cars and hot metal mixers provide extra tonnage that means extra savings

The superior toughness and uniformity of KX-99 in hot metal car and hot metal mixer linings has provided such outstanding service records, many leading steel companies have standardized on their use.

The exceptional properties of KX-99 brick enable them to better withstand erosion and slag action. Uniformity of size permits laying up KX-99 with very thin joints to better withstand the scouring and washing action of molten metal.

KX-99 LINING IN HOT METAL CAR.

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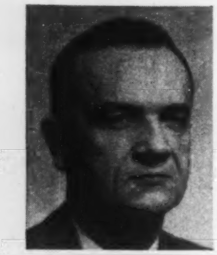

J. F. GALBRAITH
Manager, Welding Div., Linde Air Products, New York

D. J. CHAMPION
Vice President, Champion Rivet Co. Cleveland

DAVID SCIAKY
President, Sciaky Bros. Inc. Chicago

L. H. FLORA
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FORUM ON TECHNICAL PROGRESS

New hand welding method set for debut this spring . . . fastener trend is to closer tolerances, smaller sizes, higher strengths . . . brazing with silver continues to grow . . . ultrasonic welding shows much promise . . .

Mr. Galbraith . . .

The search for a good all-position process to weld carbon steel with a consumable electrode is leading to some interesting developments: Carbon dioxide shielding, cored wires, coated wires and magnetic fluxes have either been announced or are in the early field trial stage.

At the moment, a process using the magnetic flux principle appears to have several advantages in terms of quality, flexibility and cost. With a consumable electrode fed from a coil as large as 600 lb, it is possible to get exceptionally high duty factors on a production basis. A reduced amount of spatter and an easily removed fused flux contribute to high production.

In the welding of stainless steel and aluminum, the trend continues to consumable, small-diameter wires in the inert gas. Wires 0.020 in. in diameter are being used on a production basis with 0.050 to 0.060-in. material. The process is faster than the tungsten-arc, and, in some cases, lends itself better to mechanization. New equipment, better techniques and improved fixturing have combined to make such progress possible.

Substantial progress has been made in surfacing with the inert gas, consumable electrode. Stainless steel cladding for nuclear vessels is becoming common, while copper is used extensively for projectile banding.

Multipower installations in submerged-arc welding are increasing, with two Scott-connected, alternating current arcs showing some outstanding advantages. Compared with other techniques, this system is faster and easier to control. It needs no more equipment or controls than are necessary for a single wire.

Mr. Champion . . .

The 1957 market for arc welding electrodes, steel rivets and hot upset forgings will be excellent. It will amount to something over 2 per cent of the country's annual steel production.

Traditionally, structural fabrication and erection use rivets. Two newer schools of thought will continue to gain favor.

The first: Shop riveting and high strength bolted field erection. The techniques are used primarily in large structures.

The second: Welded shop fabrication and welded field erection. This approach will find more success in lighter structures.

Mr. Sciaky . . .

Sales of resistance welding equipment reached a new high in 1956. For the first time, sales growth did not depend on a full-scale war effort. A major factor was the education of potential users.

The most significant development is the predetermined, electronic counter, weld control. It gives resistance welding more quality. It is the answer to integrity in an individual weld. This new principle erases any doubt as to the ultimate consistency of welder operation.

Resistance welding is no longer limited to the fabrication of sheet metal. It will fasten heavy gage sheet and bar stock to simple screw machine products. There is unusual economy in welding heavy steel beams for building construction.

The coming year has all the earmarks of another record smasher.

Mr. Flora . . .

Advances in high-speed fabrication place increasingly heavy demands on fastener design. Since they produce billions of units annually, fastener manufacturers must continually review and improve equipment and processes to maintain constant uniformity.

FRED L. PLUMMER
Director of Engineering, Hammond Iron Works, Warren, Pa.

JOHN J. CHYLE
Director of Welding Research, A. O. Smith Corp., Milwaukee. President, American Welding Society

A. M. SETAPEN
Manager of Engineering Handy & Harman, New York

F. R. HENSEL
Vice President, P. R. Mallory & Co. Inc., Indianapolis

The value of the spring steel fastener is becoming increasingly apparent. The material can be stamped, twisted, doubled or bent into any shape or size. It will perform a lot of functions in a single application. When they include screw, stud or panel-locking, multiple-function fasteners shave days from a production schedule. Such fasteners are becoming a byword for design engineers who create products that are clean, attractive and competitive with no sacrifice in quality.

Mr. Plummer . . .

The impact of atomic energy is especially sharp and widespread in the fabrication and joining of metals. More severe service requires the use of new alloys and metals which have had little commercial use. Some of the better known metals are being used in unprecedented thicknesses.

The effects of steep temperature gradients, high temperatures and atomic radiation on properties of base and weld metal are complicated. The shielding ability of a metal is of prime importance.

The reactor vessel for the Duquesne Light Co. plant at Shippingport, Pa., required the welding of a manganese (1.10-1.50), molybdenum (0.40-0.60) steel in thickness up to 10 in. It was necessary to develop special welding, heat-treating and inspection techniques.

The use of zirconium, beryllium, boron and their alloys and several less familiar metals is increasing rapidly. That involves practical, economical procedures for the production and testing of welded joints.

For inert-gas shielded arc welding, the use of CO_2, rather than argon and helium, is being explored and developed by several manufacturers of welding equipment. Look for important new applications and resulting significant economies.

Mr. Chyle . . .

The emphasis in welding will be on greater productivity. This will mean more automatic operations. The carbon dioxide process will play a big role in that trend.

The automobile industry has accepted it as a new welding tool. The economy of CO_2 welding increases productivity by reducing labor. It is one of the important forward moves in arc welding and the future for it is bright. Look for more applications, not only in light gages of metal, but in heavy plate fabrication.

The inert gas processes will find increasing application in the welding of aluminum. Welding will grow in direct relation to the amount of aluminum produced.

Ultrasonic welding is a new tool which shows much promise.

Mr. Setapen . . .

The number and variety of uses for brazing with silver alloys have steadily increased. This trend should continue in 1957.

In addition, there may be some new applications because of two recently introduced brazing alloys.

The first group is a series of silver alloys containing small amounts of lithium, a strong deoxidizer. They are highly successful for brazing stainless steel because they reduce refractory oxides and produce highly uniform joint strength. Since they are self-fluxing, they eliminate the problem of flux removal from parts like honeycomb structures.

The second group consists of high-nickel alloys (72.50 to 93.25 per cent nickel), with the balance made up by silicon, boron and chromium. The nickel alloys are for high temperature service and offer considerably better strength and resistance to oxidation at elevated temperatures. Typical applications: Stainless steels, chrome-cobalt-tungsten alloys, Inconel, Nichrome and similar heat resistant alloys.

Mr. Hensel . . .

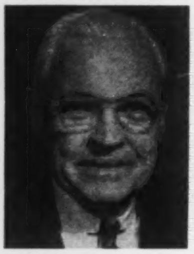
Through 1956, the trend to more mechanized resistance welding greatly increased. Cost reduction programs emphasized the need for special machines in which resistance welding is integrated with other mechanical operations like forming, drilling and tapping.

This can be done by integrating the welder with other machines working on the same assembly. Work is automatically handled from station to station. For smaller assemblies, the machine can be mounted around the workpiece.

There is increased interest in the means for welding difficult materials with variable current and force relationships. One such system employs a welding force developed by the current passing through an electromagnet. A modification combines resistance welding and percussive welding.

Still new but showing considerable promise is the means for joining metals by ultrasonic energy. It seems to be useful in joining such metals as copper, aluminum and other materials which are normally troublesome.

The Welding Research Council is



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Vice President, Russell, Burdsall & Ward Bolt & Nut Co.
Port Chester, N. Y.

W. C. POTTHOFF
Vice President, Aeroprojects Inc.
West Chester, Pa.

I. A. OEHLER
Vice President, Operations, American Welding & Mfg. Co., Warren, O.

GEORGE A. GADE
Vice President, Standard Pressed Steel Co., Jenkintown, Pa.

R. C. SINGLETON
Vice President, Engineering, Nelson Stud Welding Div., Gregory Industries Inc., Lorain, O.

sponsoring considerable work on seam welding, mash seam welding, series spot welding, fatigue of spot welds, contact resistance and projection welding.

Mr. Davey . . .

Design and production men are giving more attention to nut and bolt assembly techniques. Realization that tightness is as important as fastener selection has led to torque specifications, better instruction to assemblers and more use of controlled torque wrenches.

Greater attention to inventory cost has led manufacturers to simplify nut and bolt usage. Specifications for fine threads and special thread fits will become less common. Coarse threads and the standard tolerance have proved superior for critical applications.

The square headed bolt is on the way out in mass production. Use of high strength bolts in construction will continue to grow. Because complex structures can be bolted without special setups, bolting is moving back from the job site into the fabricator's shop.

Mr. Potthoff . . .

Ultrasonic or vibratory welding is a new concept in metal joining. It is a solid-state metallurgical bond, made quickly, with low clamping force, low external deformation and no fusion.

Much work has been done with aluminum alloys, brass, copper and stainless steel. Other metals will be welded in this manner, including magnesium, molybdenum, titanium and many of the exotic metals.

Continued development will expand the range of materials, gages and joint geometries which can be welded.

Mr. Oehler . . .

Where resistance welding is employed as a step in a production line operation, increased attention will be given to combining welding with other operations in a special purpose machine. Since the pieces to be joined must be positioned and supported, it is an advantage to machine, form or size the part at the same time. That saves appreciable loading and unloading time, compared with successive, single purpose operations.

Resistance welders intended for welding operations only are designed to facilitate loading. Rising and swinging platens will permit loading and welding of complex or irregularly shaped parts.

There must be further development of instrumentation to monitor machine performance. Ideal rapid nondestructive methods also must be developed for critical load bearing joints.

Mr. Gade . . .

The trend in fasteners is toward higher standards to meet the demands of rapid technical developments.

Designers demand closer tolerances, higher speeds, greater horsepower, smaller units, lighter construction and materials that perform reliably at high temperatures.

Fastener manufacturers must invest in research.

Our firm, for the first time, produced titanium aircraft bolts with tensile and fatigue characteristics comparable to those of steel. The tensile strength of alloy steel fasteners has been increased to 220,000 psi. Tensiles as high as 300,000 psi are in the not too distant future. Increased tensiles were achieved without sacrificing fatigue values.

Thread fits are being held to closer tolerances and gaging methods are being subjected to critical analysis. Microfasteners are becoming more important as the electronics and instrument fields expand, and, to judge from the response to a new line of self-locking screws, the demand for such a feature is growing.

Mr. Singleton . . .

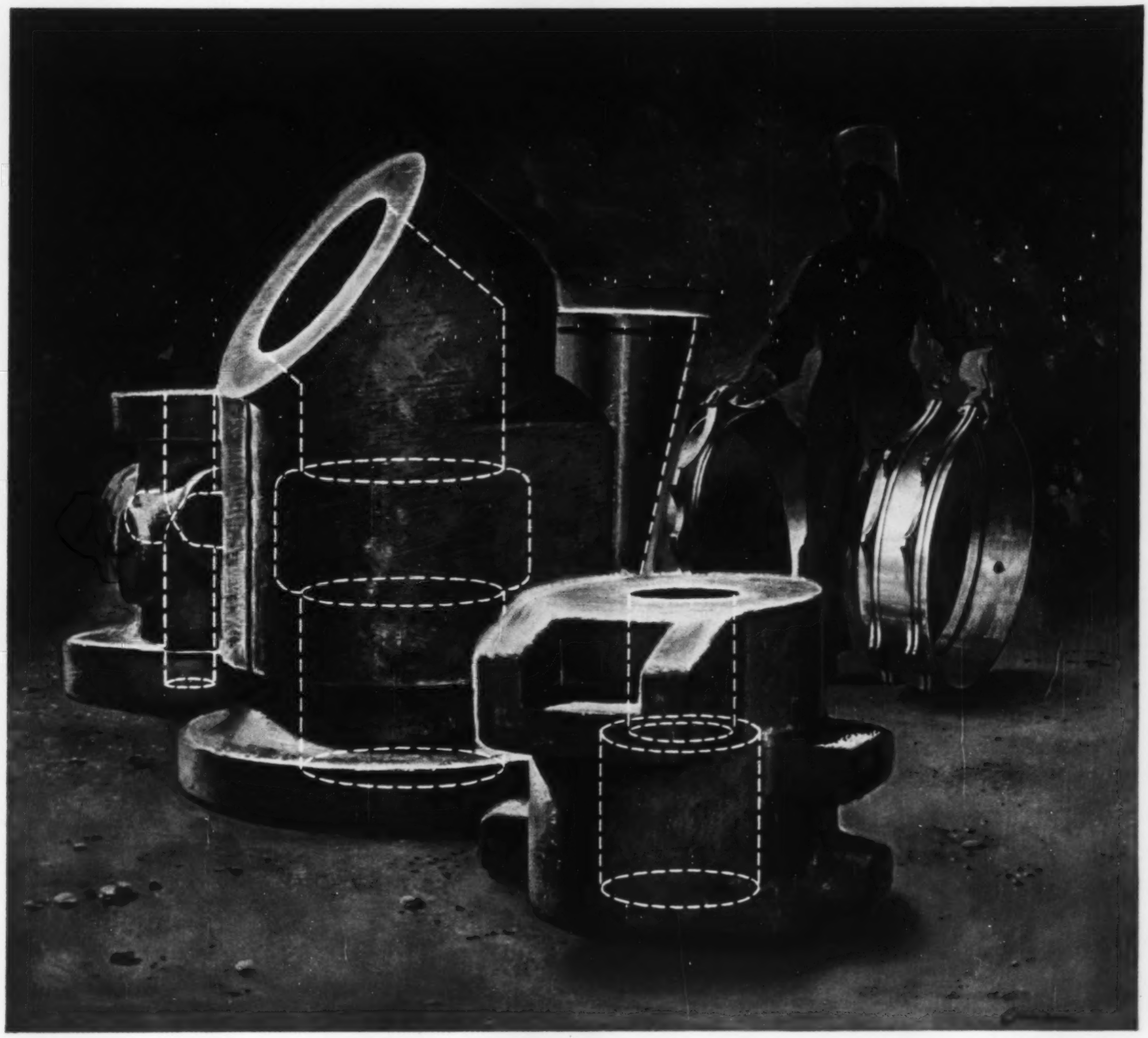
The immediate and long range future for stud welding is optimistic because of its wide general acceptance as a dependable process.

In slightly more than ten years, stud welding has grown from a substitute process to one which handles products especially designed for it.

In construction, end-welded studs are used as shear devices to tie concrete slabs to steel beams. They offer the designer and fabricator a low-cost flexible method for installing shear connectors.

In industrial construction, field-assembled curtain walls are a major market for stud welding. Here again, assembly is designed for the end-welded fastener.

Expansion appears to be greatest



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are different — they are made possible by something new in the metal-working industries. Intricate ferrous forgings with internal as well as external contours are being mass-produced. These near-final shapes with greatly improved grain structures are creating a new concept in the design and use of forgings.

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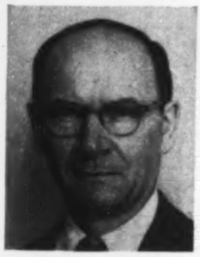
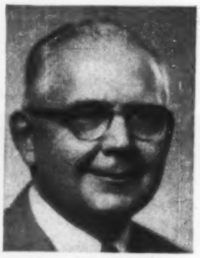


FRED WEHMER
Commercial Development Manager, Adhesives & Coatings Div., Minnesota Mining & Mfg. Co., Detroit



A. N. KUGLER
Chief Welding Engineer
Air Reduction Sales Co., New York

F. B. JACOB
Vice President & General Manager
Thomson Electric Welder Co., Lynn, Mass.

W. G. WALTERMIRE
Chief Product Engineer, Lamson & Sessions Co., Cleveland

for large diameter studs (1-in. and over). Welding power sources for them are expected soon: Some large stud welders are already available.

Mr. Davis . . .

Because it does a better job of joining and requires less material and labor than other processes, welding has several large potential markets.

Road building is the most obvious. The recent interest shown by bridge departments indicates that welding will grow rapidly in the next few years.

Another market is the machine tool industry. Several manufacturers have recently redesigned their standard lines. Grinding machine makers have produced some notable designs.

New high speed, iron powder electrodes are being developed to increase their application. There seems to be a major trend to use more of them.

Mr. Wehmer . . .

The metal bonding adhesive stands side by side with mechanical and fusion methods. Thin sheets of aluminum and magnesium can be joined more strongly with adhesives than by any other method. New vinyl phenolic and epoxy resin adhesives are available that have room temperture shear strengths up to 5000 psi. Some new adhesives maintain appreciable strengths up to 350°F.

The use of metal bonding adhesives is still in the beginning stage.

Once the advantages of strength, weight, stress distribution, sealing and protection are accepted by industry, look for a rapid increase in the use of adhesives by metalworking.

Sandwich construction is an example of the growing importance of adhesives to the aircraft and building industries. They are used in the assembly of metal and paper cores and in the attachment of skins to them.

Recent developments in polymer chemistry plus improved distribution of commercial resins have greatly increased the number of adhesives available for metal bonding. Research continues to produce high strength and temperature resistant adhesives.

Mr. Kugler . . .

Manual welding, where craftsmanship counts, is as important as ever.

The field of iron powder electrodes continues to expand. The new 6010 type has all the properties of the older, plus many new advantages.

Brazing continues as a major production tool in the metalworking industry. The use of high temperature brazing filler metals is increasing. Some of the newer aircraft depend heavily on brazing. In addition, it is lending itself effectively to automated operations through the furnace, dip, induction and resistance techniques.

Mr. Jacob . . .

I believe that the Synchromatic-type of flash welder control holds the key to the future of flash buttwelding. It is simple, flexible and lends itself readily to applications which might otherwise require special machines.

Electronic controls have been developed for preheating and postheating the work. One type can sense when the work is ready.

Automatic flash removal, like the Synchro-Shear for ferrous and the pinch-off for nonferrous metals, will gain wider acceptance.

Automation is the trend in resistance welding. There is a definite trend toward automated flash welders. Serious thought will be given to overcoming some of the inherent problems involved. Tomorrow's machine will be larger, more powerful, with simplified design features capable of other tasks besides welding.

Mr. Waltermire . . .

The trend to lighter, higher-strength, more expensive fasteners has an interesting sidelight: While the value, tonnage and quantity of bolts, nuts, screws and rivets have increased, the percentage of the nation's steel used in fasteners is dropping. The apparent reason: As users turn to high carbon or alloy bolts, they tend to reduce size.

Size reduction generally is the result of using more screws. It reduces assembly costs so that accessories and other parts can be added.

New designs, new alloys and new light metals have similarly affected production.

To meet these changes, our company and industry are modernizing rapidly. We have a new plant in Chicago; our Birmingham and Kent plants have been expanded and modernized. From 1956 to 1958, we will spend at least $8 million for improvements. That sum doesn't include re-

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New Brighton, Pa.

M. O. MONSLER
General Manager, Welding Equipment
Div., Harnischfeger Corp., Milwaukee

placements, or property acquisitions.

"Restrained optimism" sums up our opinion of the future.

Mr. Dickenson . . .

Significant advances have been made recently in precision cold forging of intricate shapes, including special fasteners. A new technique promises a brighter future for fasteners and special parts made of aluminum, steel and superalloys.

The process will produce parts which formerly were hot forged, investment cast or machined. It is successful for metals like A-286, S-816, molybdenum, Inconel 700 and 713 and Udimet 500.

With few exceptions, present superalloys as well as the more common metals will be forged to desired shapes and tolerances. Any geometry of shape common to hot forge or investment casting can be obtained with this new process.

Mr. Monsler . . .

Terrific road building in 1957 will have a great influence on the types of machines which will be manufactured. Many will be changing to single range machines able to take punishing duty cycles and high heats. This will necessitate new developments to withstand duty cycles up to

ANOTHER THOMSON CONTRIBUTION TO BETTER, FASTER RESISTANCE WELDING

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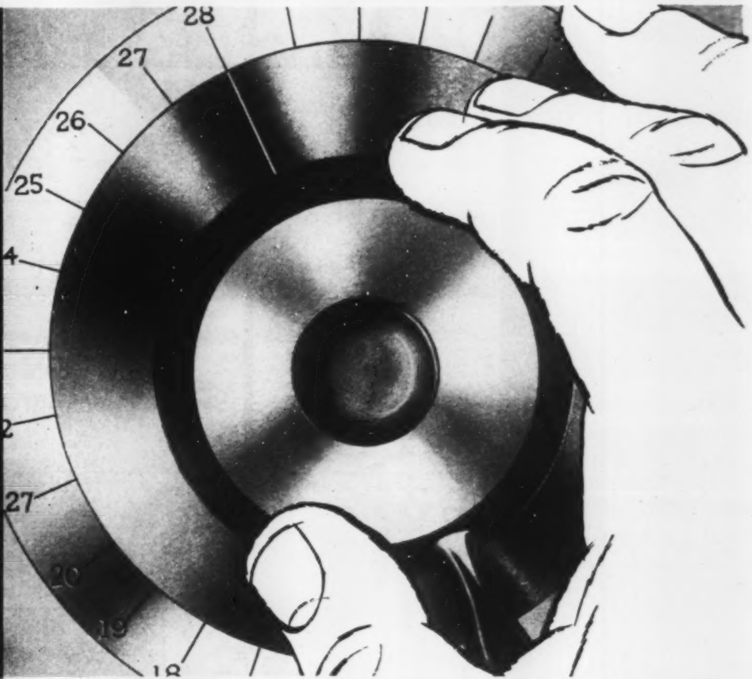

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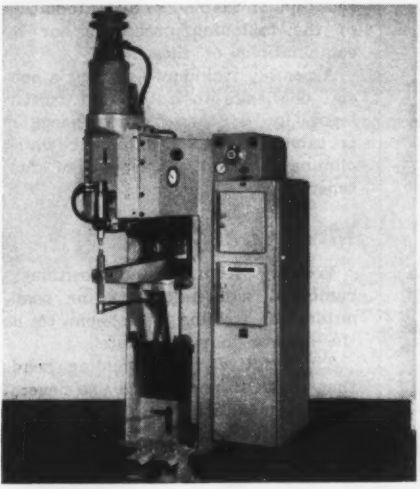
CALI-MATIC

The "Cali-Matic" control is used with an electronic timer and phase shift heat control.



THOMSON Model A Press Welder equipped with "Cali-Matic" for one dial set-up.

ONE DIAL SETS ALL VARIABLES

Turn one dial . . . and "Cali-Matic" will instantly set up any air operated spot or projection welder for any combination of materials and thicknesses. Force, weld time, heat, hold time — as many as five or six variables — all are adjusted simultaneously by a single setting knob.

This completely new concept in resistance welder control provides simple, errorproof machine set-up for spot welding, projection welding, mash welding, jump welding, stud welding, cross wire welding and similar operations. It can also be adapted for seam welding and for three-phase as well as conventional single-phase power.

"Cali-Matic" becomes your *welder expert*, eliminating the need for a special set-up man. The unit has a range of settings which easily provides for more than 100 combinations of materials and thicknesses or a similar number of drawing or parts numbers. Anyone capable of operating the welder can make the simple, single adjustment needed for any job set-up.

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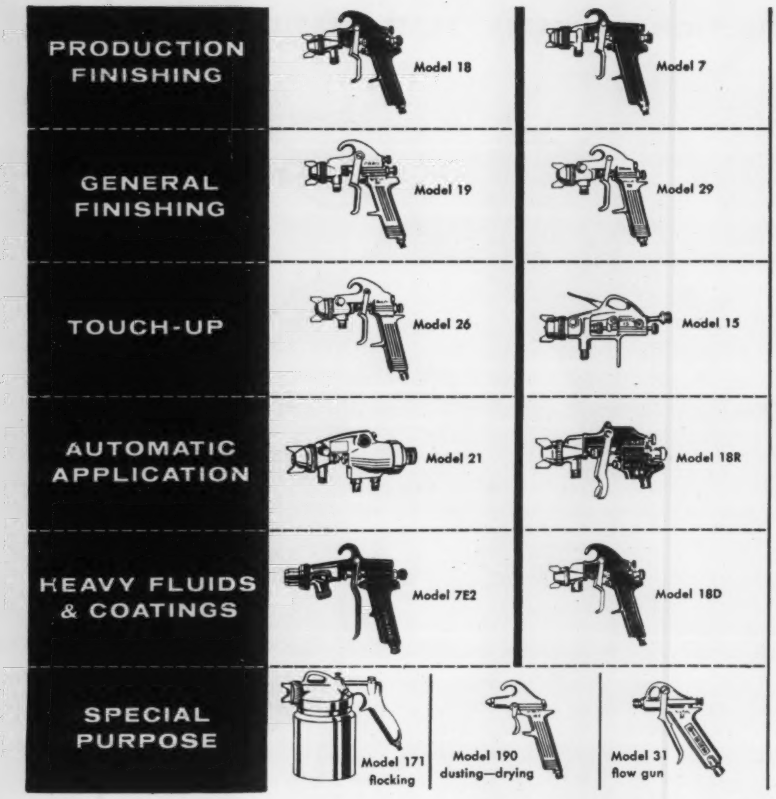

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80 per cent and 500 to 600 amperes.

Many of the electrodes will have to be redeveloped to take higher heats and faster weld metal deposits. Some new ones are already being developed.

Mr. Tinnerman . . .

Automation in mass production will force metalworking executives to pay more attention to assembly. Its problems will be met by redesign of the assembly (which eliminates or reduces the number of fasteners), by redesign of fasteners, by automation of the fastening procedures or by combinations of these.

Assembly techniques present a special challenge to automated fastenings. One of the greatest needs is portable fastening equipment which eliminates hand placement of fasteners.

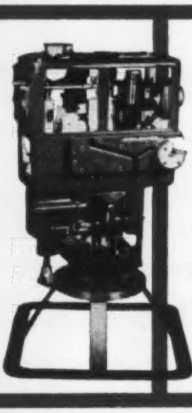
Mr. Evans . . .

Welding fixtures and positioners combined with automatic or semiautomatic welding still seem to be the answer to rising costs.

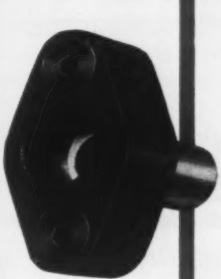
The relatively new welding heads that make it possible to use several processes (like submerged and inert gas shielded arc with one head) give job shops added versatility at no additional cost for specialized equipment.

5 practical ways to "streamline"

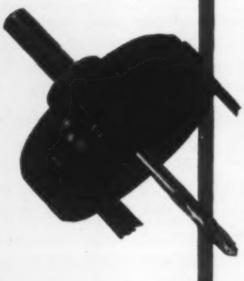
...without sacrificing fastening strength



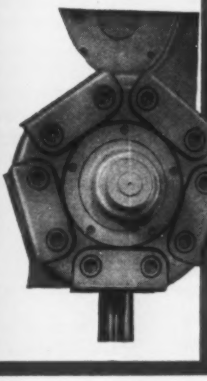
1. Counterbored holes are the simplest approach to flush surfaces using standard socket cap screws. The advantage of specifying genuine Allen ○ Head Cap Screws is the greater strength of Allenoy steel... you can use smaller sizes for closer spacing and reduced weight. Call on Allen, too, for *very large* socket-head, precision cap screws — up to 2½ inch diameter.



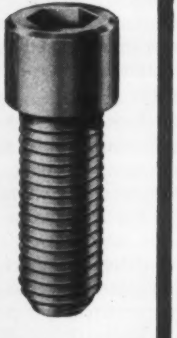
2. Countersinking enables you to get absolutely smooth external surfaces using Allen ○ Flat Head Cap Screws. Allen ○ Cap Screws feature the exclusive Leader Point which makes screw starting easier and guards against thread damage.



3. Button Head Cap Screws produce snag-free unbroken surfaces where countersinking is impractical. Button-head hex sockets are necessarily shallow. In genuine Allen ○ Button-Head Cap Screws, sockets are cold forged without broaching, in extra strength Allenoy steel... essential protection against stripping the sockets under high torque pressure.



4. A ready made hole tapped in forged steel solves many a design problem. It's called the Allenut. It can be anchored in soft material to assure durable threading, or recessed to permit tightening with an Allen Hex Key.



5. Bright finish, or rust and corrosion resistance call for Allen ○ Stainless Steel Cap Screws. They are standard stocked items (both NF & NC threads) readily available in a wide range of sizes from Allen Distributors.

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More companies buy special equipment . . . floor conveyors will make debut . . . flat steel strapping finds greater use in product identification . . . new trucks will have greater maneuverability, lifting speeds and workload capacity . . .

Mr. Mallick . . .

The tendency to mechanize is leading toward better planning. Many industries are finding that a more thorough job of operation analysis and plant layout is proving to be the best solution to material handling improvement.

Use of three-dimensional models in plant layout has fostered new techniques in material handling planning: Engineers can combine motion studies with equipment arrangement and the functional design of buildings. We are rapidly approaching the era of the "functional unit," with the entire processing cycle taking place with a minimum amount of interruption and manual handling. Most industries are finding that this is the practical approach to automation. For other than continuous process industries, the pushbutton factory is still some distance in the future.

Mr. Walter . . .

Pneumatic, hydraulic and electrically powered machines are making the job of applying strapping easier, faster and better. More is being done with the push of a button. Some developments have taken place in the area of completely automatic strapping.

Improvements, particularly in round steel strapping, have been pronounced. More strength is being packed into smaller sizes which results in more economy to the consumer. The packaging of round steel strapping will also improve as the use of the fiber drum is expanded. The drum not only acts to give better over-all protection but also serves as a handy dispenser.

In addition to its primary function of packaging or unitizing, flat steel strapping will also find increasing use in product identification. One major steel warehouse is using flat steel strapping seals to identify the grade of steel in a package.

Mr. Keplinger . . .

Continuing development and use of interior linings have opened up new markets for steel drums and pails. Marked advancement has been made through the formulation of epoxy-phenolic type linings for the hard-to-package products.

There will be continued research on corrosion inhibition for treatment of unlined containers—this field is one in which the steel manufacturers also are active.

Technical committees of the Steel Shipping Container Institute meet frequently with major industries, the armed forces and other government purchasing agencies. These meetings will be continued to develop improved specifications and design. A program to implement the design phase will be started at Battelle Memorial Institute this year. Its purpose is to evaluate the comparative life cycles of containers in use. It is believed that this program will lead the way to better design and probably to the use of lighter gages of sheet steel.

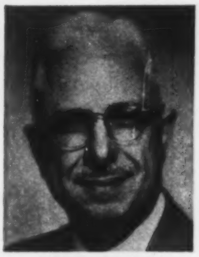
Mr. Davis . . .

The trend toward greater use of LP gas-powered trucks was emphasized in 1956 when a major automobile manufacturer standardized on LP gas after a thorough study. This trend will continue, and probably accelerate, in 1957.

Side-loading fork lift trucks continued to find many new applications in 1956, and an even higher rate of growth is expected in 1957. The range of applications is being extended by the introduction of new types and capacities of trucks employing the side-loading principle. In 1957, a pneumatic-tired, gas-powered model with a capacity of 6000 lb will be introduced. Development

R. C. SOLLENBERGER
Executive Vice President, Conveyor Equipment Manufacturers Assn.
Washington

C. B. SMYTHE
President, Thew Shovel Co.
Lorain, O.



EUGENE CALDWELL
Vice President & General Manager, Hyster Co., Portland, Oreg.

A. F. ANJESKEY
Sales Manager, Cleveland Tramrail Div., Cleveland Crane & Engineering Co., Wickliffe, O.

work on other models with capacities that are smaller and larger than present models is nearing completion.

Greater versatility and provisions to reduce maintenance and make for easier operation were the primary features of trucks introduced in 1956. One example is the increasing attention to torque converters or other automatic transmissions. By eliminating shifting, they make the operator's work easier and avoid overworking clutches.

Mr. Sollenberger . . .

The needs of commerce and industry call for a closer tie among the branches of engineering. A conveyor system is apt to be the result of combined mechanical, structural, electronic, electrical and construction engineering talents.

Modernization of plants remains a large area for conveyor purchases. Mechanization of handling and partial automation will be the only answer for a lot of plants. Wisely applied conveying and other forms of mechanical handling equipment will provide the means of keeping handling costs to a minimum.

Transportation of people and the things they need is a development of the last few years which is exciting the imagination of city planners and community developers. A number of installations are working, and many others are in the drawing board stage.

Our road building program will call for many conveyor systems in construction, material preparation and suppliers' plants.

Mr. Smythe . . .

The expansion of outside manufacturing and storage facilities is made easier and less costly when mobile crane equipment is available or is developed to do the job. As more heavy material, subassemblies and equipment are stored, processed and handled outside, the need for larger, more mobile yard cranes has developed.

In development is a rubber-tired, self-propelled crane with a new two-engine design and a lifting capacity of 75 tons. It can handle a 200-ft boom. This unit will have four travel speeds on the job—1.5 to 12 mph. A 7-ton capacity rubber-tired crane also is being developed. It steers on all four wheels for better close-quarter maneuverability because of its ability to move almost sideways.

Other developments include greater accuracy and increased ease of load control. Methods by which the operator can handle loads from his cab position without ground crews and hook-on men are developing rapidly. They are being engineered into "in process" material handling programs to reduce manufacturing and labor costs.

Mr. Caldwell . . .

An increasing number of industries are making comprehensive cost studies of their material handling operations. Their value is illustrated by a Westinghouse Electric Corp. study, which revealed to management that material handling annually consumes over 8 million man-hours, more than twice as much as any other single function.

Developments designed to increase storage capacities of present and proposed plants and warehouses will be particularly significant as new construction costs rise. Special high lifts now permit the maximum utilization of space through the ability to stack to greater heights—in many cases doubling usable plant and warehouse areas.

Important improvements also have been made in reducing the size of material handling trucks while increasing their load capacities. Sharper turning radiuses, power steering, automatic transmissions and automotive type controls make for more effective industrial truck operation in less space than they formerly required.

Mr. Anjeskey . . .

A new system permits vertical storing or stacking of coiled rods. In two installations, storage has increased at least 100 per cent in the same area used for conventional horizontal storage.

In addition, sizes, heats and alloys can be separately stored without sacrificing storage capacity, and an accurate inventory can be maintained because the contents of each well or stack can be readily identified.

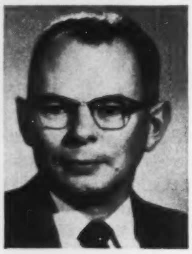
With the demand of rod purchasers for coil bundles weighing 600 lb and up, bundles must be tightly tied or banded to prevent individual coil turn entanglement. This makes handling difficult and causes shutdowns at the wire drawing operation.

Development of strapping material, such as flat bands or wire ties,

MALCOLM J. ODELL
Vice President-Research,
McLaurin-Angier Co.,
Needham Heights, Mass.

ROLAND WHITEHURST
Vice President & General Manager,
Exide Industrial Div., Electric
Storage Battery Co., Philadelphia

ROBERT H. DAVIES
Vice President, Industrial Truck Div.,
Clark Equipment Co., Battle Creek, Mich.



ROBERT F. RICE
Manager, Crane Department
Whiting Corp., Harvey, Ill.

HOWARD M. PALMER
Vice President & General Sales Manager,
Lewis-Shepard Products Inc.,
Watertown, Mass.

plus automatic banding equipment installed at the end of the rod cooling and inspection conveyor, will eliminate these problems and reduce the cost of hand tying.

Mr. Odell . . .

Volatile corrosion inhibitors are gaining wider acceptance from manufacturers who must protect iron and steel parts from rust. Researchers, using radioactive isotope tracer techniques, have uncovered information on how the VPI's do their job.

Suppliers of automotive parts and fabricators will be interested to know that except for porous metal surfaces, such as cast iron, there seems to be little need for including oil or grease as supplementary preservatives where VPI is used. Evidence indicates that this practice often does more harm than good.

Research shows that materials which must be removed before use are not needed or even desirable.

Last year marked the beginning of widespread use of VPI lined cartons, a trend which will certainly continue.

Mr. Whitehurst . . .

Handling trends in metalworking point to increased use of electric trucks because of increased production and the need for greater efficiency to preserve profit and cost ratios.

The emphasis will be on added maneuverability, shorter turning radiuses, higher lifting speeds, greater workloads and other improvements in electric industrial trucks. It is expected that the demand for such improvements will continue to obsolete many of the trucks that have been in service for years.

Even though electric trucks do not wear out or require substantial maintenance, the need for improved efficiency to preserve profit margins will continue to create a demand for new, more powerful units.

The new trucks will require superior battery performance in terms of long life, dependability and power-to-weight ratio.

Mr. Davies . . .

Demands of automation will create a new phase in material handling. Until now, the concern has been with powerful equipment to mass handle a big volume of goods.

The new theme will be precise control of basic types of fast, versatile equipment to handle smaller volumes and a wider variety of "custom" products for specialized functions.

Automation will be the means by which this is accomplished economically, and material handling equipment and handling systems will be designed as an integral part of the over-all process.

These developments will require refinements in our methods of communicating control orders from production centers to handling centers. We have seen the beginnings of this in the use of radio-directed fork trucks. The next step will be electronically controlled equipment geared to a specific automated process. Automated handling systems planned for whole factories will follow.

Mr. Rice . . .

The crane industry is working toward standardization of components, particularly alternating-current, slipring motors. It soon should be possible to use motors from any manufacturer without changes in mounting dimensions, or in electrical control equipment.

Manufacturers also are striving to reduce the weight and size of components by using better quality material, such as alloy steel, heat treatment and improved motor insulation.

Improvements are being made in the control of alternating current crane motors so the crane hook can be moved in small increments and high speeds can be provided for rapid material handling.

Mr. Palmer . . .

The trend toward increased compactness, versatility and ease of operation in industrial trucks will receive added emphasis in 1957 models.

The narrow-aisle concept in material handling should gain greater acceptance. For the first time, many companies will make use of narrow-aisle trucks to gain more storage space in their warehouses.

Palletless handling of materials is another development to be watched. Special storage racks for use with this system are now available.

Equipment has kept pace with

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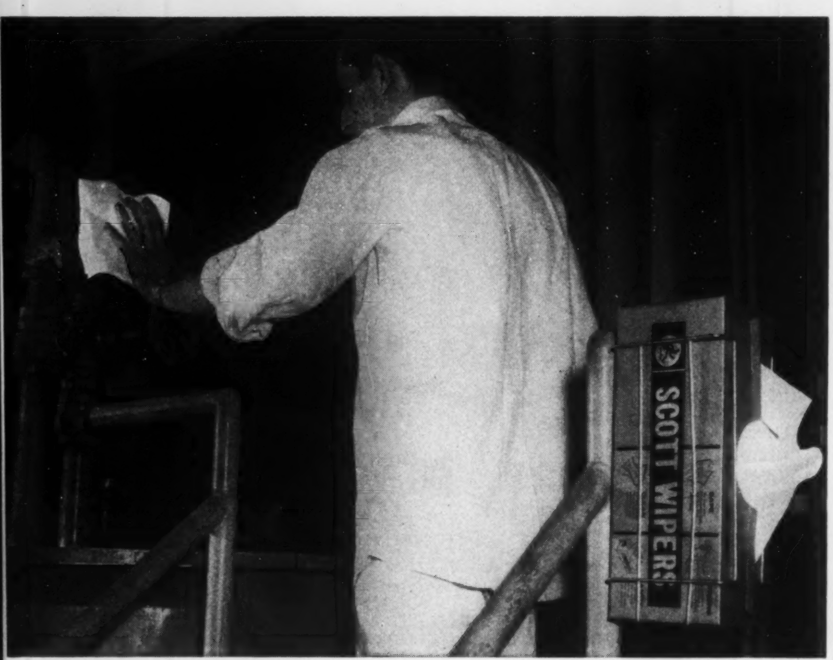

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President, Material Handling Institute Inc., Pittsburgh

E. F. TWYMAN
Vice President, Yale & Towne Mfg. Co., New York

FRED L. HOOPER
Executive Vice President, Cambridge Wire Cloth Co., Cambridge, Md.

J. H. PERITZ
Executive Secretary, Electric Overhead Crane Institute Inc., Washington

LESTER M. SEARS
Chairman
Towmotor Corp., Cleveland

these innovations, as typified by industrial trucks with rear-wheel drive. This type will turn in its own radius. Stability is improved because the truck's mast is recessed between the load wheels, minimizing the tendency to overturn. All controls are at the operator's fingertips; new controls and brakes make for smoother starting and stopping.

Mr. Raymond . . .

Education is playing a big role in the growth of the material handling industry. Engineering schools are establishing special courses of study; technical schools and colleges are offering night and short courses.

Material handling is an integral part of automation, which is perhaps the biggest immediate stimulus to the growth of our industry. New concepts which require equipment that will make the movement of goods even more mechanized than it has been are being developed.

Automatic controls are being installed to reduce the need for manual supervision. Electronics are playing a big part in this development. New uses for hydraulics are being found, and basic principles of good engineering are being applied to create new ways of moving materials.

Mr. Twyman . . .

The material handling industry will continue to expand faster than the general economy this year. Sales of industrial lift trucks in 1956 were the highest in history.

The accelerated sales of material handling equipment is predicated on three factors:

1. There is a growing replacement market. The great volume of fork trucks sold during and immediately after World War II are being replaced by more efficient and versatile equipment.
2. There is an increasingly broader base for the sale of equipment. More of the smaller industries are seeking the same cost savings larger industries are achieving through mechanized handling equipment.
3. The material handling industry is constantly developing new products to help meet the need for a widening scope of handling problems. Two new developments: Trucks for "narrow aisle" handling and trucks with pneumatic tires for "outside storage" problems.

Mr. Hooper . . .

Faced with rising costs of labor, materials and equipment, management must find ways to reduce manufacturing costs. Conveyorization which goes beyond material handling is one possibility.

Conveyorization must be adapted to production processes, so that more products can be processed during movement. Continuous heat treating and annealing are two examples of this trend.

Woven wire conveyor belts are well suited to many continuous processes involving temperatures and corrosive conditions. A recent survey of the metalworking industry indicated that only one plant in ten is using woven wire belts for combined movement and processing.

Nonautomated plants must convert to automatic production if they are to compete with their automated competitors.

Mr. Peritz . . .

Booked sales and backlogs in the crane industry continue to reflect the increasing building expansion commitments of many industries which depend on cranes as basic material handling equipment.

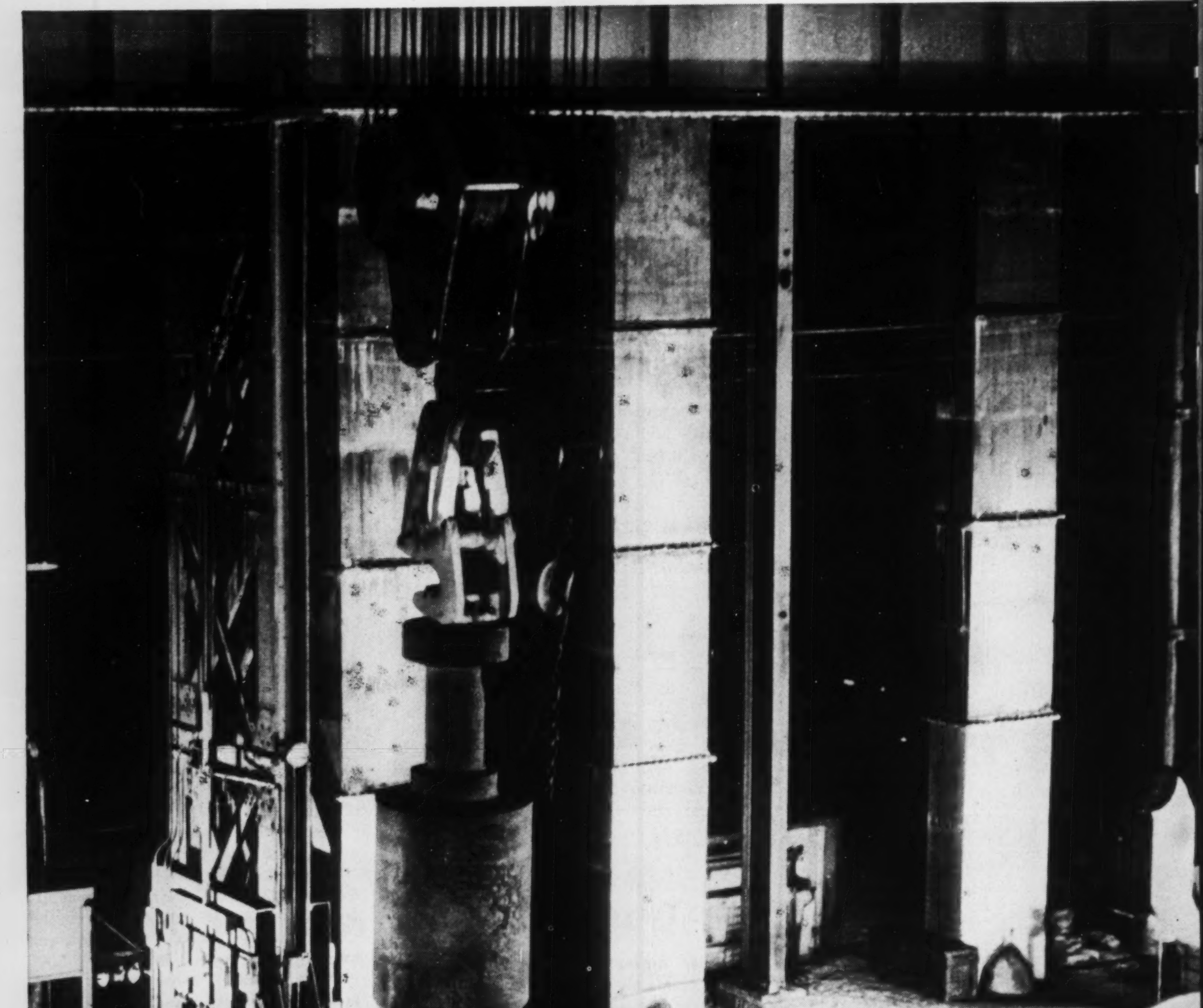
Crane development and trends in application will be affected by:

1. Use of new NEMA frame motors which will permit appreciable weight saving in crane construction.
2. Buildings planned with material handling equipment in mind.
3. Increasing demand for wider spans and greater load capacities.
4. Faster speeds and more exact crane hook control, leading to an increase in predetermined duty-cycle and automatic crane operations.
5. Modernization or replacement of cranes in service to increase speed and load capacities.

Mr. Sears . . .

Recent technical developments in fork lift trucks and the many accessories for handling products have broadened the use of this equipment to otherwise difficult and costly material handling operations.

The introduction of the hydrostatic drive will do away with friction clutches and markedly simplify the application of tractive power. Power steering provides easier handling of loads and greater maneuverability in narrow aisles. Other advances include: Improved braking;



Giants, too, heated without distortion

Westinghouse pressurized furnaces keep 30-ft forgings "straight as an arrow" at U. S. Steel

Three large, Westinghouse pit-type furnaces at U. S. Steel's Homestead Works are built to pamper giant forgings. This turbine rotor, for example, lifts out straight and true at 1830°F. During eight hours of soaking heat the temperature along its 30-foot length never varied as much as 10°F. Distortion was never a problem because of Westinghouse temperature control and positive pressure furnace design.

In this design even heating is assured through back pressure control of combustion gases. With positive pressure in the furnace any air leakage is always outward. Thus localized chilling of the work is prevented. The furnace is tangentially fired by means of spirally located burners and is equipped with 3 zones of automatic temperature control. Since the products of combustion are sucked out from the bottom of the furnace, heat currents make two passes the full length of the work...once upward, once downward.

In Westinghouse experience with gas, electric, or induction heating equipment, we have undoubtedly solved a problem like yours. You can be sure of our broad experience by calling your local Westinghouse industrial heating engineer today or write Westinghouse Electric Corporation, Industrial Heating Division, Meadville, Pa. J-10451

YOU CAN BE SURE...IF IT'S
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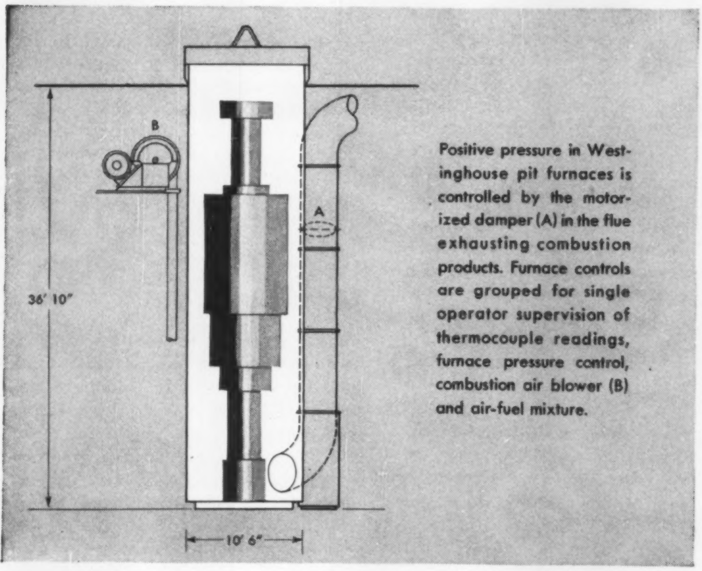

Positive pressure in Westinghouse pit furnaces is controlled by the motorized damper (A) in the flue exhausting combustion products. Furnace controls are grouped for single operator supervision of thermocouple readings, furnace pressure control, combustion air blower (B) and air-fuel mixture.

W. E. Collar reports . . .*

Facts to lick your distortion problem

Unusual facilities and experience at Westinghouse have enabled us to jump years of trial-and-error methods in engineering furnaces and induction heating equipment to prevent distortion. We're constantly after better ways to gain temperature uniformity in metal processing equipment. This is necessary not only to prevent distortion but also to obtain desired metallurgical properties.

On special problems, our equipment design engineers have the advantage of facts gained through Westinghouse metallurgical research activities. Production testing of equipment design and engineering is carried out by our Materials Manufacturing Division at Blairsville, Penna. These activities back up our long experience in gaining accurate heat distribution for positive temperature uniformity.

The results can be seen in a Westinghouse furnace used for the air tempering of rotors for atomic equipment. Accurate heat control designed into this electrically heated furnace meets demanding requirements for distortion-free work.

Another case in point is the work on distortion problems under way in our induction heating laboratory. Here equipment is being developed for distortionless hardening of automotive axles.

The teamwork that solved these application problems is your assurance of getting the latest in engineering development and the finest equipment for all your metal processing needs.

**Manager, Industrial Heating Dept.*

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Elwell-Parker Electric Co.,
Cleveland

L. WEST SHEA
Secretary, Material Handling
Institute Inc., Pittsburgh

W. S. HUSS
President, Acme Steel Products
Div., Acme Steel Co., Chicago

an increase in lifting and lowering speeds; and improved stability in lifting, lowering and turning operations.

There have been refinements in both gasoline and LP engines, involving higher compression ratios and horsepower, and in their application to fork lift trucks. Regardless of load or grade, performance is smoother.

Greater attention is being given to developing basic models of lift trucks which can be readily equipped with accessories to satisfy special handling requirements.

Mr. Webb . . .

There is a movement toward greater use of automatic handling and processing equipment that can be installed in a manufacturer's production line with little additional direct cost.

This trend also includes dispatching systems which eliminate the human element in warehousing, shipping and flow of components to specific manufacturing areas.

Manufacturers want handling equipment that is extremely rugged. Evidence of this is shown by the interest in designs which use heavier, more durable bearings and stronger components, such as forgings, particularly in conveyors.

Mr. Bristoll . . .

Steel strapping is making important gains. A wide cross section of industry has realized that strapping applications are innumerable, practical and economical.

Accompanying the greater use of strapping is the development and improvement of power strapping tools—both electric and pneumatic tighteners and sealers. The quality of other steel strapping products, including heavy-duty hand tighteners, flat steel strapping and seals, will have to keep pace with the greater demand for strapped packaging.

Good service and competent technical assistance for consumers can be expected to get even better as demands for steel strapping grow.

Mr. Towson . . .

Larger models with greater capacities seem to mark the trend in industrial trucks. More companies also are specifying special equipment to do jobs that cannot be done as well with standard models.

Buyers no longer resist the higher initial cost of special equipment. It has proved to be more economical in the long run.

The industrial truck industry, despite its expansion last year, did not have the capacity to meet its customers' demands. The industry has sufficient backlogs to carry it through the first half of 1957, possibly longer. The long range outlook for the industrial truck industry is one of continued growth.

Mr. Shea . . .

Material handling equipment that is easier, faster and safer to operate will be featured in 1957. Ease of maintenance is receiving top attention from designers.

Other factors to look for include mechanical and electronically controlled transfer mechanisms, dispatch and systems control. Industrial truck and crane attachments are showing rapid advances in their versatility and ability to handle more complex and heavier loads.

The Material Handling Institute's directors are forecasting that 1957 bookings will exceed 1956's by about 10 per cent. The value of bookings during 1956 foretell a gain of more than 25 per cent over those in 1955. Contributing factors for this optimism:

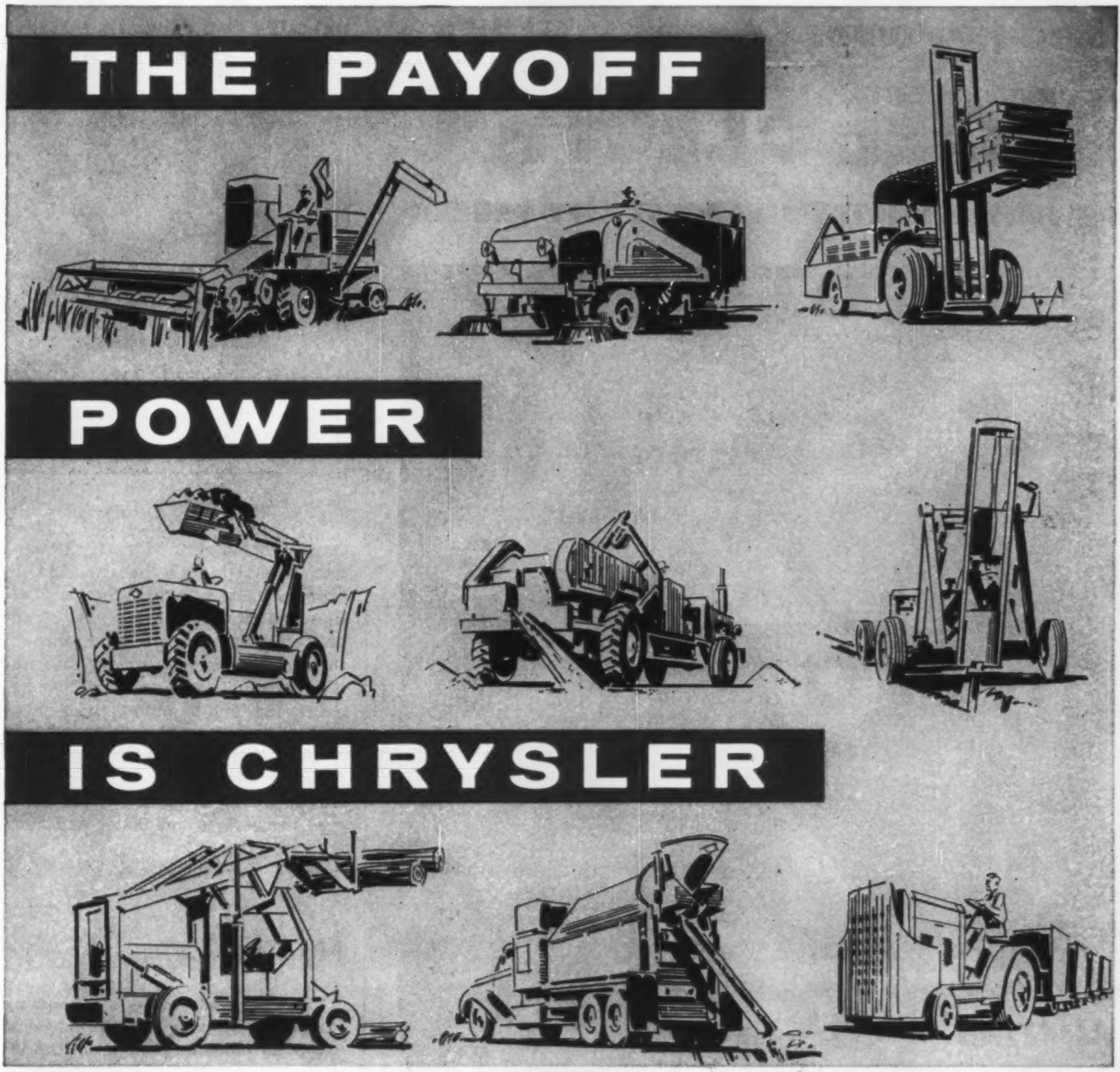
1. Material handling still offers the greatest opportunities for reduced costs and increased productivity.
2. Automation of single or multiple processes places greater demands on the handling systems.
3. There is widening influence of handling, storing, shipping and receiving materials in unit loads.
4. Shortages and high cost of manual handling plus the labor force's continued upgrading to higher skills.
5. Unsettled conditions in foreign countries, continued capital equipment buying and influence of the federal highway program combine to exert high priority on handling equipment spending plans by industry and government.

Mr. Huss . . .

Management's recognition of material handling problems and of affected economies will contribute significantly to advances in packaging this year.

We will see accelerated progress in better packaging as well as economical and safe handling of all industrial products.

The greatest strides in the devel-



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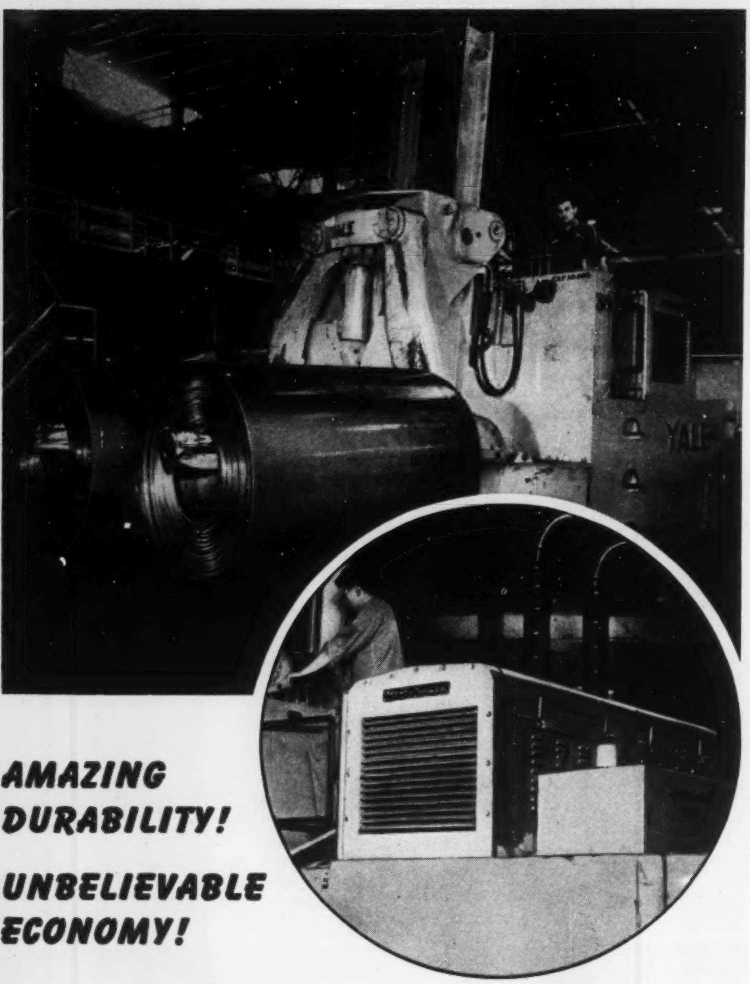

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E. W. FRANZ
Secretary-Treasurer, May-Fran Engineering Inc., Cleveland

opment of integrated material handling methods can be expected in primary metals, paper, lumber, textiles and transportation. Steel strapping will increase in importance in these developments through its applications in unitizing, skid loading, palletizing and bundling, and package reinforcement.

The improvements and advancements in material handling this year will mean high quality goods delivered to users easier, faster and more economically.

Mr. Franz . . .

The use of material handling equipment to step up the physical output of machine tools is on the increase. Methods for removing chips, turnings and borings are being improved.

In addition to the May-Fran standardization program which permits manufacturers to create their own customized conveyors from standard parts, we are preparing to offer a new concept in conveyors to metalworking in 1957.

This year, manufacturers will be able to use a conveyor of the "moving sidewalk" type for the first time. It can move continually through a plant at floor level. The new "Flat-Top" conveyor is expected to increase metalworking production, particularly in the appliance and automotive industries.

We feel that it is the duty of the material handling industry to plan for tomorrow—so that new problems of greater production will not be retarded by those who are best prepared to provide the answers.

Another **STANLEY STEEL STRAPPLICATION*** on the job

This job tension relieves headaches

There's no need to worry about the spilling or damaging of these close tolerance stampings (1,200 lbs per truck load) on their mile-long intra-plant trip to the assembly point. Stanley Steel Strapping has the great strength required to take and hold the tension that guarantees a **secure, safe** package. For the same reason, Stanley Steel Strapping is the logical choice to keep any material or package YOU ship securely bound and completely safe in transit to **any** destination. Stanley can provide whatever size strapping is just right for your needs and the tools — hand or power — that assure easy, fast strapping.

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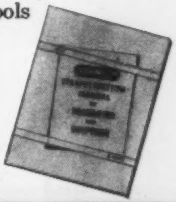

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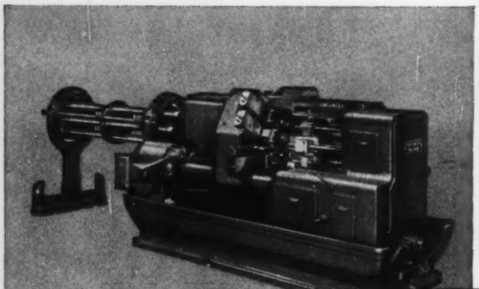

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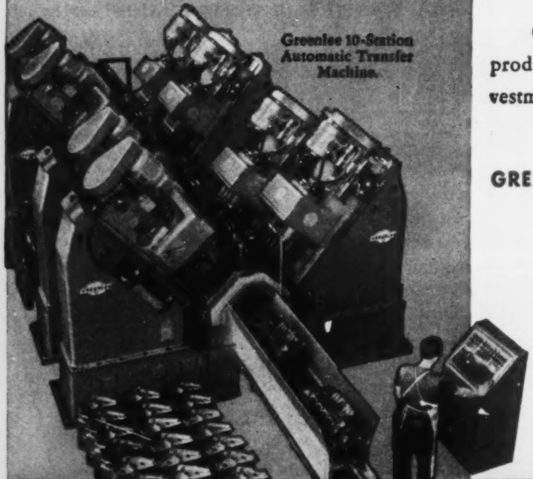

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Mr. Stutson . . .

Increased use of central circulation systems for lubrication and hydraulic systems demands a fluid that meets machine needs and remains unchanged for long periods. The speed and loading of parts will increase, demanding antiwear characteristics and better lubricity to assure smooth, chatterless motion and reduced wear.

In many types of production machinery, there is a trend toward operating conditions that result in bulk oil temperatures considerably above the average. Better high-temperature oils will be required.

There is a growing use of precision-made gearing for large and small machines in production operations. They are being loaded several hundred per cent higher than those which have been common. Use of this type gear in production machinery will require highly stable oils with the antiwear characteristics.

Mr. Boyd . . .

Probably the most important technical advance in cutting and grinding compounds in 1957 will be new automation-type water solubles that will handle cutting and grinding operations efficiently. Usually, a cutting compound has high lubricating qualities and low cleaning characteristics, and grinding compounds have low lubrication and high cleaning ability.

Wider use of chemicals has brought the development of water soluble compounds that have both high lubrication and excellent cleaning properties. They will answer one of the biggest problems of automation lines—a single coolant that will efficiently handle all varieties of cutting and grinding.

Increased sales and acceptance of automatic screw machines designed to function with water solubles will place new emphasis on extreme pressure type compounds. These compounds equal or surpass conventional cutting oils on automatic screw machine operations.

Mr. Espey . . .

Recent research into the mechanism of open gear lubrication has shown that, by careful selection of base stocks and recently developed additives, marked improvements can be made in the life of open gear compounds. Lubrication life has been extended nine to ten times that obtained with other compounds. Less frequent application means real economies in labor and material. Coupled with this is greater assurance that the gears will not run dry and cause wear.

Lower viscosity products can be applied without heating or cutting back with solvent. Many users who use cut-back products or products requiring heat for application to achieve satisfactory open gear lubrication will be able to use lower viscosity products. We see a continuation of the trend toward lubricants designed to operate over wider ranges of operating conditions and yet be more easily applied.

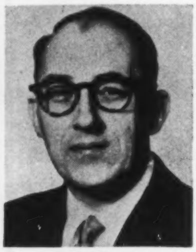
Mr. Witzenburg . . .

The greatest factor affecting changes in industrial lubrication is the need for divorcing lubrication from its dependency on the human element. Today's machines are bigger, faster, more complex and as automatic as it is possible to make them.

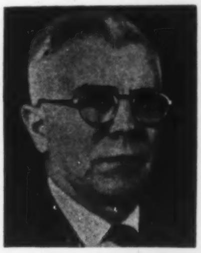
Lubrication has to be done automatically and in a way to insure that each bearing gets its correct amount of the right type of lubricant when it is needed. There must be no shutdown for lubricating and an absolute minimum of down time for maintenance. Wastage of today's

R. F. REPENNING
Staff Engineer, Industrial Products Dept., Shell Oil Co., New York

ALEX P. FOX
Vice President, Lincoln Engineering Co., St Louis



CHARLES E. REED
General Manager, Silicone Products Dept., General Electric Co
Waterford, N. Y



LESTER B. PERKINS
Vice President & General Manager
D. A. Stuart Oil Co. Ltd., Chicago

specially compounded, expensive greases cannot be tolerated.

Until recently, one major problem to which there was no answer from the standpoint of centralized, automatic lubrication was the application of the heavy unpumpable greases to large open gearing of the helical and herringbone type. It has been solved through joint action of the lubricant and centralized lubrication equipment manufacturers.

The lubricant manufacturers have been able to compound the greases with diluents which make them pumpable. The grease can be sprayed onto the gear face with a compressed - air - operated centralized lubrication system.

Mr. Repenning . . .

Recent developments in the non-soap grease field have resulted in the introduction of improved multipurpose lubricants.

They offer distinct performance and economic advantages. When compared with conventional, soap-base multipurpose grease, they insure a broader scope of application because of their higher thermal and mechanical stability, added water resistance and corrosion protection properties. Low temperature properties are equal to those of the best available conventional products and the generally used high temperature limit may be extended at least 150°F.

The relentless demand for increased production capacity has compelled the industry to maintain a continuous expansion program. Equipment manufacturers are able to meet the demand because of technical progress along a broad front. But, major production increases result in higher loads, speeds and temperatures. They inevitably increase the lubricant burden. Coupled with the production drive is the constant need to lower or stabilize costs and maintain a high safety record. Maximum equipment utilization and safety can be achieved only by minimizing repair down time and stopgap operational maintenance. The quality and service life of maintenance materials play a key role in this matter.

Mr. Fox . . .

The squeeze between costs and selling prices makes it imperative that workable ways be found to preserve profit margins. Management has discovered a gold mine in the multiple benefits provided by centralized lubrication systems which automatically control the application of the right lubricant, in the right quantity, at the right time.

The oil can in the hands of an oiler or operator can no longer be relied upon or even tolerated. In the final analysis, industry must dissociate lubrication from maintenance. Maintenance is an intermittent operating function, the need of which is indeterminable, and its occurrence unpredictable. Lubrication is a continuing operating function. Its need is imperative, its occurrence can be predetermined and its planning is simple and positive.

Mr. Reed . . .

Silicones are the only fluids known which retain sufficient viscosity to permit the operation of hydraulic systems at +700°F and −65°F and below. Over this extended range, they provide sufficient lubricity to protect bearings and gears of many types. They still have some limitations involving bearing metal combinations and speed factors.

These silicones are modified methyl phenyl types. They have more lubricity than their predecessors, the methyl silicones, and better high temperature stability as well.

Unlike their predecessors, these materials are receptive to additives, though there still is a problem of finding additives with temperature stability comparable to that of the silicones. With rare exceptions, they neither affect nor are affected by metals, even under high temperature. Applications include: Clocks and timing devices exposed to wide temperature ranges, metal drawing and rolling compounds, fluid transmissions, conveyor systems, rotating electrical equipment, cutting oils and compounds, instruments and controllers, servomechanisms and hydraulic systems.

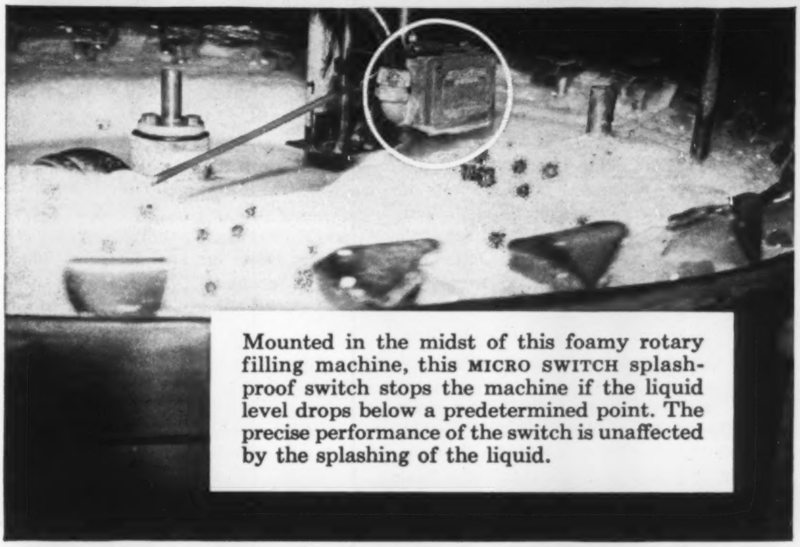
Mr. Perkins . . .

Changes in manufacturing methods that will have the greatest impact on the type of metalworking fluids used are those involving the elimination of cutting and grinding tools. Increased applications of powdered metals, plastics, precision stamping, heavy cold forming, precision hot forming, flame and arc cutting and electronic methods still in the experimental stage will result in greater use of relatively new and different lubricants, or their elimination.

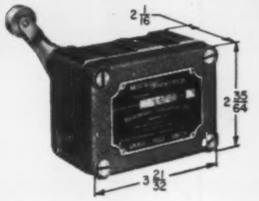
We can look to a continuing large consumption of conventional industrial lubricants for cutting and grinding operations, with a tendency towards higher performance standards. This will be the result of in-

MICRO SWITCH . . . FIRST IN PRECISION SWITCHING

H HONEYWELL



Mounted in the midst of this foamy rotary filling machine, this MICRO SWITCH splash-proof switch stops the machine if the liquid level drops below a predetermined point. The precise performance of the switch is unaffected by the splashing of the liquid.

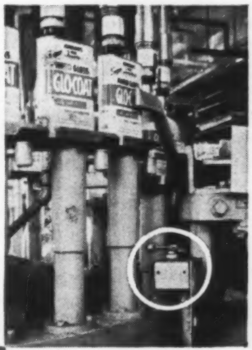


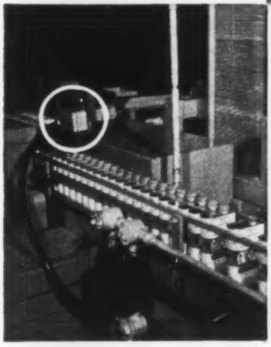
MICRO SWITCH Splash-Proof Switches are constructed to resist the splash of liquids. A seal on the actuating shaft and a gasket on the cover gives a good seal against normal splash conditions. A heavy aluminum housing protects the enclosed switch. These switches combine long electrical life with accurate repeatability. They are available with adjustable roller-arm actuators (shown) or with push-rod plunger actuators. Can be supplied with a variety of electrical ratings and contact arrangements.

Splashed all day with liquid wax...

MICRO SWITCH Precision Switch performance is unaffected

MICRO SWITCH precision switch is used to prevent "jam up" on a rotary can-filling machine. If the platform sticks and does not lower to the level of the conveyor, the switch stops the conveyor until trouble is corrected.





Switch at the left is held operated by the nozzles of the cans. Should a can be upset, or reversed, the switch actuator releases, opens the circuit and the conveyor stops. Another switch keeps track of the supply of knock-down shipping cases, in a similar manner. It stops the conveyor if the supply is low.

MICRO SWITCH controlled equipment is faster and more efficient—produces more in less time. Thousands of plant superintendents, electricians and maintenance men have made their equipment "perk up" with MICRO SWITCH precision switches.

Johnson's Wax Company engineers chose splash-proof MICRO SWITCH precision switches to control packing equipment in their modern Racine plant. From controlling the level of the rotary filling machine, through every packaging step, MICRO SWITCH units insure safe, efficient operation as over 200 cans are filled in each line per minute.

There is a MICRO SWITCH distributor near you. Let him show you a variety of switches and practical applications that have paid off for others. Send for MICRO TIPS DIGEST. It's jam-packed with ideas.

See MICRO SWITCH Catalog No. 83 for complete information on the wide line of heavy-duty precision switches for industrial use. Wire today.

MICRO SWITCH

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

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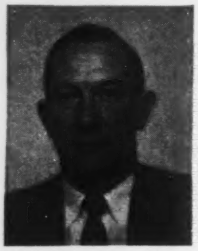


C. T. LEWIS
Chief Lubrication Engineer, Republic Steel Corp., Cleveland

H. A. HARTUNG
Application Research Div. Atlantic Refining Co., Philadelphia

W. W. SCHEUMANN
Vice President, Cities Service Research & Development Co., New York

W. P. YOUNGCLAUS JR.
Administrative Secretary, American Society of Lubrication Engineers Chicago

B. M. DUNHAM
Technical Consultant, Sun Oil Co. Philadelphia

creasing production requirements offsetting the reduced use of these methods in forming operations. The chief development in industrial lubricants will encompass improved drawing compounds, extrusion lubricants and forging compounds.

Mr. Lewis . . .

Here is a method of system preparation that shows promise of acceptance: Chemical pretreatment of oil circulating systems to clean out residual scale, dirt and other contaminants, and to pacify the surfaces contacted by the oil to aid in maintaining future cleanliness.

Systems also are kept cleaner and tighter through the use of some recent synthetic sealing materials which are applicable under wide temperature and contaminant conditions.

Continuing efforts of the lubrication engineer will convert more "old school" maintenance people to the use of more efficient lubrication practices.

Mr. Hartung . . .

Manufacturers of industrial lubricants will continue to upgrade their products for three basic reasons. First, competition inevitably leads to the economic survival of the best product at the lowest cost. Second, manufacturers and operators of industrial machines are recognizing that high quality industrial lubricants are usually cheaper in the long run because they result in lower maintenance costs. Third, industry is aware of the many advantages of multipurpose products, including lower application costs, smaller inventories, better housekeeping and less chance for costly errors in application.

From this favorable environment, many improved products will emerge. Cutting oils will be more effective; noncorrosive grades of greatly enhanced performance will appear. Hydraulic oils, turbine oils and general purpose lubricants of improved quality may be expected. Multipurpose greases with outstanding load-carrying ability are being introduced; novel greases based on inorganic thickeners are under continuing development.

Mr. Scheumann . . .

Petroleum research laboratories are developing programs around the application of nuclear energy as it may affect the quality of finished products. This not only encompasses the processing of finished materials but also the treatment of the products after they have been manufactured. A good deal of research is being conducted in the development of radiation-resistant oils and greases. While the call for such products is limited, increasing demand is anticipated.

Gear tooth loadings continue to be increased. As a result, new extreme pressure products have to be developed. Increased temperatures resulting from increased speeds have created problems in product stability, making it necessary to develop oils and greases with increased oxidation stability. New antioxidants are appearing in our petroleum products.

With the increasing use of metals like aluminum, magnesium and titanium, new problems have arisen with respect to cutting oils, corrosion prevention, core and mold oils, etc. It is becoming increasingly evident to the engineer that lubricants and the application of them to industrial equipment must be highly developed if we are to take advantage of everything this equipment has to offer.

Mr. Youngclaus . . .

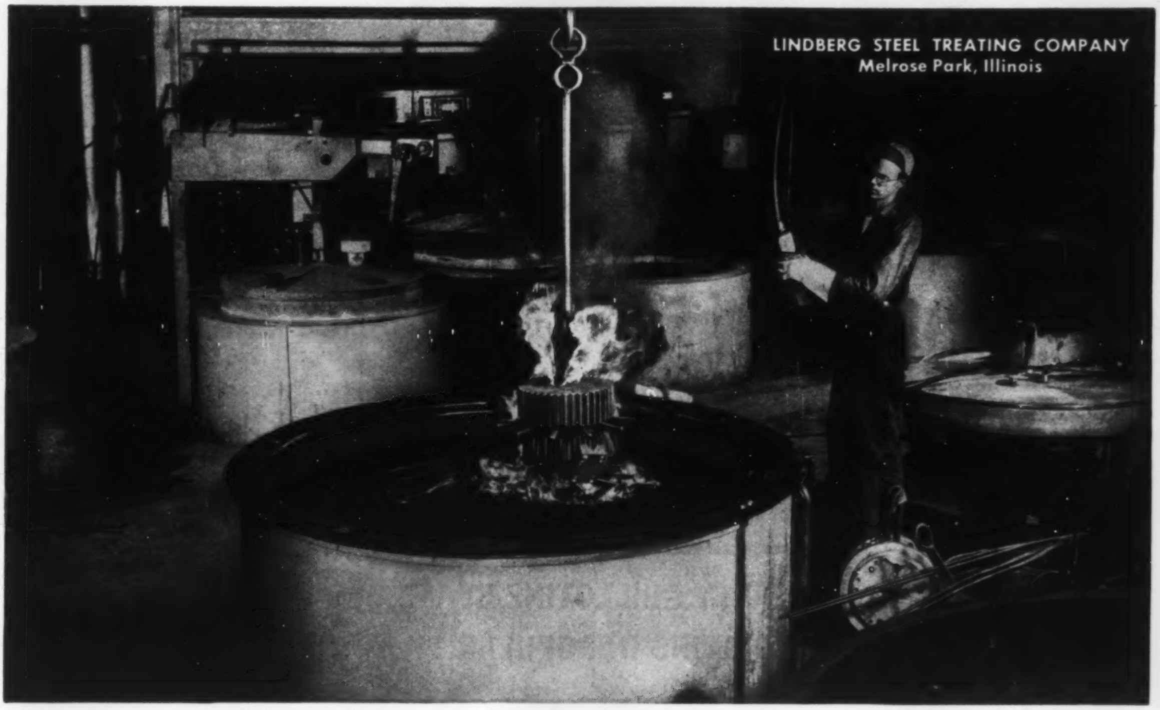
One of the most significant and encouraging signs in industrial lubrication has been the awakening of plant management to the benefits that can be realized from planned programs. This trend has been a long time in coming, but there is every indication that it will continue to spread.

In the final analysis, success or failure of industrial lubrication practices does not rest with the equipment manufacturer or the lubricant supplier, but squarely on the shoulders of those who use the equipment. They must select the lubricants and apply them.

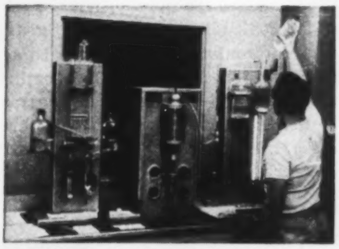
This year increased attention is sure to be focused on the reduction of expenses. One of the most effective means of accomplishing this in industrial plants is through intelligent lubrication.

Mr. Dunham . . .

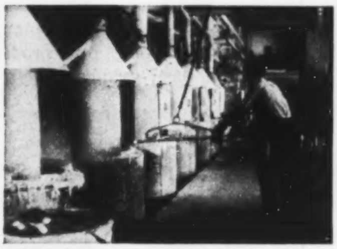
Automation in industrial plants is increasing the requirement for improved lubricants and metalworking



For machine shop tolerances—
Lindberg uses Cities Service Quenching Oil



Lindberg's Lab stringently tests treated metals. Dimensional changes from poor quenching oil would quickly show up here. But Cities Service Quenching Oil cools metal with no significant dimensional change.



Some of Lindberg's Furnaces. Here, they heat-treat all kinds of steel products . . . bolts, washers, gear blanks, saw blade segments, etc. Steel for bars of Illinois State Penitentiary was one of their first jobs.

At Lindberg Steel Treating Company a routine order might include a dozen shafts, stamping and forming dies, jigs and fixtures and even production parts. But though the products might differ, most would carry the same stipulation—heat treat with very low dimensional change.

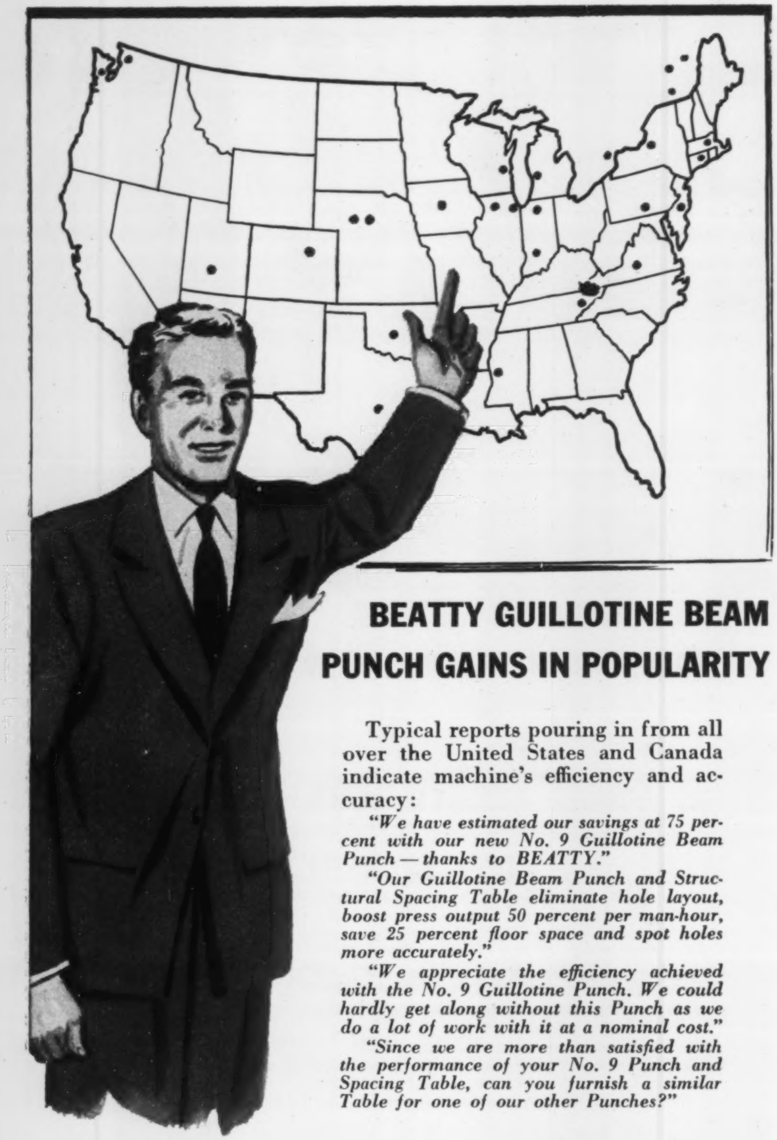
To some heat treating operations this might present a problem, but not to Lindberg. By the use of Cities Service Quenching Oil, they're able to cool their steel with no significant changes in dimension.

"In addition," say Lindberg metallurgists, "we like Cities Service Quenching Oil because it has high flash point, consistent viscosity, excellent oxidation resistance. and a stable cooling rate."

Anyone looking for a better quenching oil would do well to try this superior Cities Service oil. For further information, talk with your local Cities Service Lubrication Engineer. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS



BEATTY GUILLOTINE BEAM PUNCH GAINS IN POPULARITY

Typical reports pouring in from all over the United States and Canada indicate machine's efficiency and accuracy:

"We have estimated our savings at 75 percent with our new No. 9 Guillotine Beam Punch — thanks to BEATTY."

"Our Guillotine Beam Punch and Structural Spacing Table eliminate hole layout, boost press output 50 percent per man-hour, save 25 percent floor space and spot holes more accurately."

"We appreciate the efficiency achieved with the No. 9 Guillotine Punch. We could hardly get along without this Punch as we do a lot of work with it at a nominal cost."

"Since we are more than satisfied with the performance of your No. 9 Punch and Spacing Table, can you furnish a similar Table for one of our other Punches?"

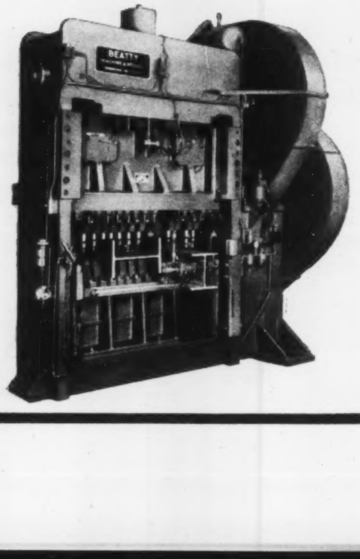
PRODUCTION GIANT REQUIRES LESS FLOOR SPACE

Ideal machines for punching flanges and webs of beams, Beatty Guillotine Beam Punches require less floor space, offer lower first cost and extreme rigidity. Large die space, clear working space and two-point application of force to the ram affords full capacity loading and punching across the face of the ram.

200-ton Model 9, illustrated, for beams up to 30", punches all holes in web of 30" beam. 150 and 350 ton models also available.

Write For Full Details

BEATTY MACHINE & MFG. CO.
966 150th St., HAMMOND, IND.



EARL L. H. BASTIAN
Senior Engineer, Shell Oil Co
New York

oils. Reduction of maintenance, higher precision parts and uninterrupted production require higher quality lubricants. There will be an ever increasing demand for lubricating oils having characteristics which will afford longer service life, better antirust and corrosion protection, better film strength, friction reducing properties and constant cleansing action. Development of detergent type hydraulic and circulating system oils embodying long service life and satisfactory water separation properties is a definite requirement.

Research will continue to perfect antileak oils for hydraulic, gear case and circulating oil systems to accommodate machinery which cannot be taken out of production for maintenance to meet production schedules.

Multipurpose lubricants will be more in demand to simplify lubrication scheduling, handling, manpower training and dispensing. Colored fluids may aid in identification and help to simplify dispensing.

Considerable progress is being made and will continue to develop better petroleum based products for rolling aluminum, brass, stainless steel and titanium alloys. Progress is being made in the development of more efficient oils for production thread and form grinding.

Mr. Bastian . . .

New materials like zirconium present lubrication and cooling problems. But when they are compared with fluid requirements used for more ordinary metals like aluminum and copper alloys, the new applications are of more technical than commer-

HE KEEPS THEM ROLLING— THE MAN FROM ATLANTIC

The Atlantic specialist in industrial lubrication is a highly skilled expert. He's spent years in the study of every heavy lubricating and cutting-oil problem . . . and he's backed by other Atlantic specialists in lubrication research, production, quality control and marketing.

Atlantic's experience since 1870 has made us familiar with *your* lubricating needs. We've developed the products necessary to do any lubrication job perfectly . . . at the lowest cost . . . for every wheel that turns in industry.

Your company can benefit from our extensive experience and services. For further information on Atlantic's family of products for industrial lubrication and metal processing, write or wire Dept. S1, The Atlantic Refining Company, at the nearest office listed below.

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READING, PA.
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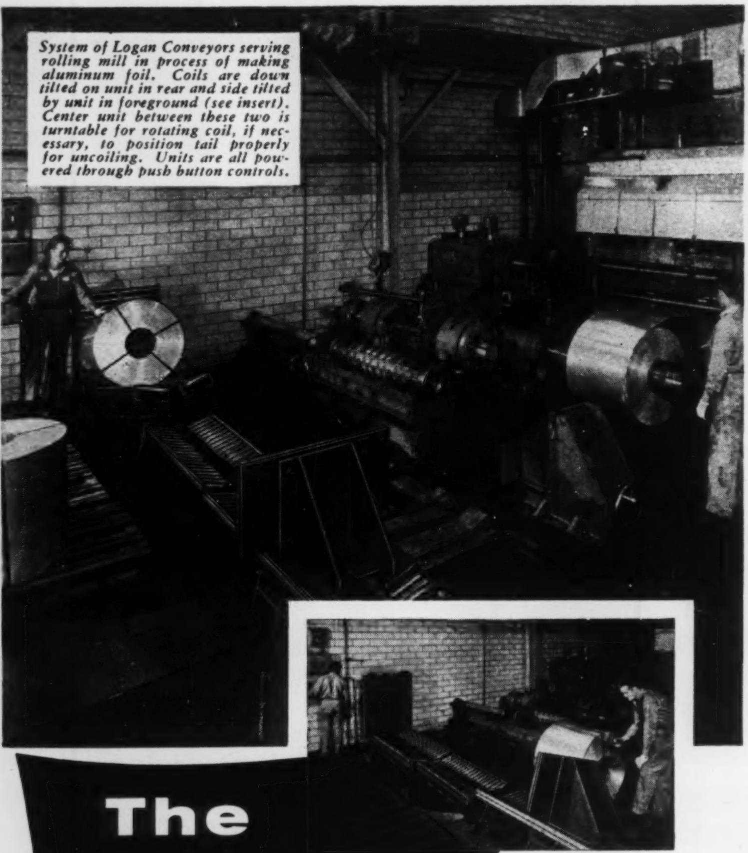
Atlantic Refining Company of Brazil
Edificio Castello
151 Avenida Nilo Pecanha
Rio de Janeiro, Brazil

Porto Rico Oil Company, Inc.
Box 4832, San Juan, Puerto Rico


System of Logan Conveyors serving rolling mill in process of making aluminum foil. Coils are down tilted on unit in rear and side tilted by unit in foreground (see insert). Center unit between these two is turntable for rotating coil, if necessary, to position tail properly for uncoiling. Units are all powered through push button controls.

The LEADERS use Logan

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ELI LILLY & CO.
LORD & TAYLOR
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A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Leadership, in the industrial world, is closely allied to the use of mass production equipment such as Logan Conveyors. Large plant or small, the "principles" of mass production can be utilized to advantage. Conserving manpower, saving priceless time, increasing plant capacity, maintaining satisfactory working conditions are some of the contributions which Logan Conveyors make to the mass production process. Let Logan work for you, too. Write for nearest engineer or for further information.

LOGAN CO., 535 CABEL ST., LOUISVILLE 6, KY.

Logan Conveyors

JOHN R. McCOY
Manager, Technical Service
Indiana Commercial Filters Corp.
Lebanon, Ind.

cial interest.

New processes involving methods for the continuous casting, rolling and extrusion of ferrous and nonferrous metals are developing rapidly. Automation is being evolved as a means to more efficiently utilize available skilled manpower.

In these fields, the increased utility of new heavy duty fluids and coolants is apparent. The cooling requirement in many cases has predetermined the recommended use of water-based emulsions and solutions—particularly where the composite use of carbide and high speed steel tooling is designed into one machine, or a group of machines supplied from the same coolant system.

Mr. McCoy . . .

Independent surveys have revealed that dirt and dirty hydraulic fluids caused a high percentage of failures in hydraulically actuated machinery. Solids, abrasives and oil-deterioration products will quickly destroy precision-fitted parts, causing leakage and slippage of pumps and valves, sticking or sluggish pump vanes, valves, pistons and other components, and cut out packing and plug orifices. Fire-resistant hydraulic fluids aggravate dirty conditions because they are excellent paint removers, and paint removed from a system can cause untold damage. Machine design cannot eliminate difficulties due to dirt.

Efficient hydraulic-fluid filters with particle-size-removal ratings of 5 microns or less, can largely eliminate difficulties caused by dirt and contamination. They are becoming a "must" in automation.

You get **Convenience** *and* **Quality** with Johnson Bronze Bars

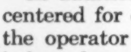
For your convenience, Johnson Bronze solid and cored bars are now stamped on each end with the exact size. This makes it unnecessary to remove bars from bins to check the OD for size—helps prevent errors—makes for quick inventory. Also, bars of various sizes can be stored in one bin because the size is visible which saves storage space.

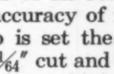
In addition, the ends of all Johnson bars are centered for ease and accuracy of machining. All the operator has to do is set the chuck on the indented marks, take a $\frac{1}{64}$″ cut and he has the size bar indicated. This speeds machining, assures concentric parts since the work is always in perfect alignment. Also, Johnson bars are in the convenient 13″ length—are easy to store and handle.

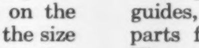
The quality of Johnson bronze bars is rigidly controlled from heat to heat by frequent chemical analysis. These bars are produced in permanent molds or by centrifugal casting. Either method eliminates the possibility of sand inclusions—allowing maximum uniform density.

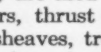
Johnson Bronze bars are available in over 400 stock sizes. They are used extensively for making bearings, washers, thrust plates, gears, pinions, guides, rollers, sheaves, trolley wheels and other parts for original equipment and maintenance. They are quickly available from your distributor. Ask him for a folder which lists the range of sizes of cored and solid bars or write Johnson Bronze Company, 550 S. Mill Street, New Castle, Pa.

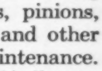
Johnson Bearings

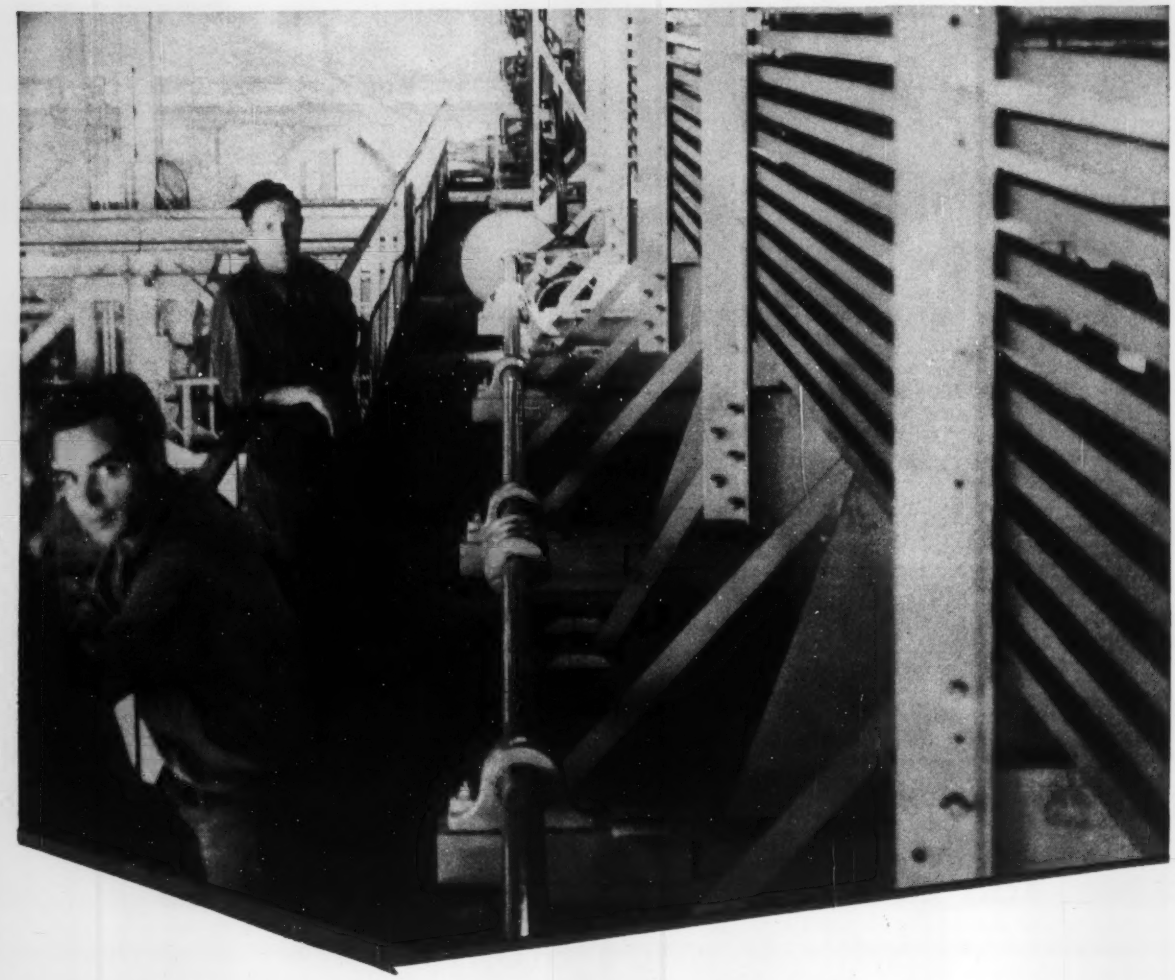

GRAPHITED
over 175 sizes


GENERAL PURPOSE
over 900 sizes


UNIVERSAL BRONZE BARS
over 400 sizes


LEDALOYL
over 400 sizes


ELECTRIC MOTOR
over 350 sizes



here's how Bearings, Inc. cuts the overhead on overhead cranes

This 30 ton crane with a 95 foot span was so inefficient it lost many hours of work every month. The Bearings, Inc. engineer recommended a complete conversion to anti-friction bearings and showed plant management how easily and inexpensively the conversion could be accomplished.

We supplied all bearings, seals, housings, and caps for 16 bridge wheel bearing journal boxes. The drive motor was converted to roller bearing end bells.

Main drive line shaft from the motor to the wheels was converted to roller bearing pillow blocks. An adapter on the wheel axle eliminated machining. The only additional work needed was to weld a plate with bolt hole under the crane frame where units were mounted.

Crane now starts under load at first contact point on control and is the fastest crane in the plant. Crane was pulling 350 to 400 amps.; now uses less than 200 amps. Crane operator withdrew a request for transfer to another crane after conversion was completed.

Do you have a slow moving, inefficient crane in *your* plant? Ask our branch nearest you to show you how it can be converted to a fast, efficient piece of equipment at a minimum expense. Call or write NOW.

Rendering bearing service in the territories adjacent to our branches, listed below.

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OHIO: Akron • Canton • Cincinnati • Cleveland • Columbus • Dayton • Elyria • Hamilton • Lima • Mansfield • Toledo • Youngstown • Zanesville
INDIANA: Ft. Wayne • Indianapolis • Muncie • Terre Haute
PENNSYLVANIA: Erie • Johnstown • Philadelphia • Pittsburgh • York
WEST VIRGINIA: Charleston • Huntington • Wheeling
NEW JERSEY: Camden • **MARYLAND:** Baltimore
Subsidiaries: Balanrol Corp. • Buffalo, N.Y. •
Kentucky Ball and Roller Bearing Co. • Louisville, Ky.

E. A. CARSEY
Assistant Chief Engineer, Kirk & Blum Mfg. Co., Cincinnati

L. J. CATLIN
Chief Chemist, Industrial Filtration Co., Lebanon, Ind.

ROBERT C. HOOD
President, Ansul Chemical Co Marinette, Wis.

J. T. RYAN JR.
President, Mine Safety Appliances Co., Pittsburgh

SERVICE AND MAINTENANCE

FORUM ON TECHNICAL PROGRESS

Improved filters promise help in water polution problems . . . air handling equipment is larger, more complex . . . fire hazards are more complicated, automatic systems needed . . . storage batteries will have high impact cases . . .

Mr. Carsey . . .

Continued research on dust, fume and air pollution control is made necessary by today's high production. Industry is confronted with the increasing need for adequate contaminant control, both inside and outside its plants. Allowable maximum concentrations of contaminants, toxic and otherwise, must be maintained.

Advances in collection efficiency will be made in 1957. Industrial electrostatic collection may find wider acceptance. When used as a series staged secondary precipitator, following high efficiency centrifugal primary collection, such application could result in extremely effective and efficient collection.

Significant is the fact that the federal government, through the U.S. Public Health Service, is conducting applied engineering studies on the design and operating factors leading to optimum performance of fabric filters.

Mr. Catlin . . .

Public water supplies are becoming more dependent on surface waters, and more sensitive to pollution. Many states have laws which cannot be enforced without working a hardship on industries. Improved filtration techniques that remove most contaminants before discarding to waste offer help in this direction.

Industrial coolants use enormous volumes of water. Filters that are practically self-cleaning and automatic in operation can take out solid particles down to micronic dimensions. Tastes and odors are a separate problem; in some extreme cases they are being handled by pumping waste water into underground sandstones.

In the steel industry, the self-cleaning filter shows promise in handling scrubbing water for fly-ash and other problems.

Mr. Hood . . .

Fire hazards are becoming more complicated. The use of titanium and zirconium is increasing; flammable metals like sodium and potassium are being used as heat transfer agents. And the use of other hazardous chemicals, fuels and processes is on the increase.

The trend toward automation and its lessening of attendant personnel places more emphasis on the use of automatic fire protection systems. The development of processes operating at high temperature will introduce many new hazards in the use of conventional materials of construction.

Fire protection is on its way to being recognized as a legitimate branch of engineering. Evidences of this are the recently formed Society of Fire Protection Engineers and new college curriculums. Manufacturers of fire protection equipment will be forced to produce superior equipment to satisfy better trained personnel.

Mr. Ryan . . .

"Built-in safety" will receive increasing attention as the steel industry moves into the age of instrumentation and automation. A man in a white shirt and business suit now can operate a blooming mill with the help of an electronic unit which can store and "remember" operating and safety instructions.

But the worker will continue to be the most important factor in the progress of safety. A man in a white shirt who feeds data cards into a machine which controls a blooming mill is just as vulnerable to falling objects as the workman in greasy coveralls.

Head protection, once thought to be necessary only in the open hearth and blast furnace departments, is now almost universal.

Other standard safety equipment, such as gas masks and respirators,

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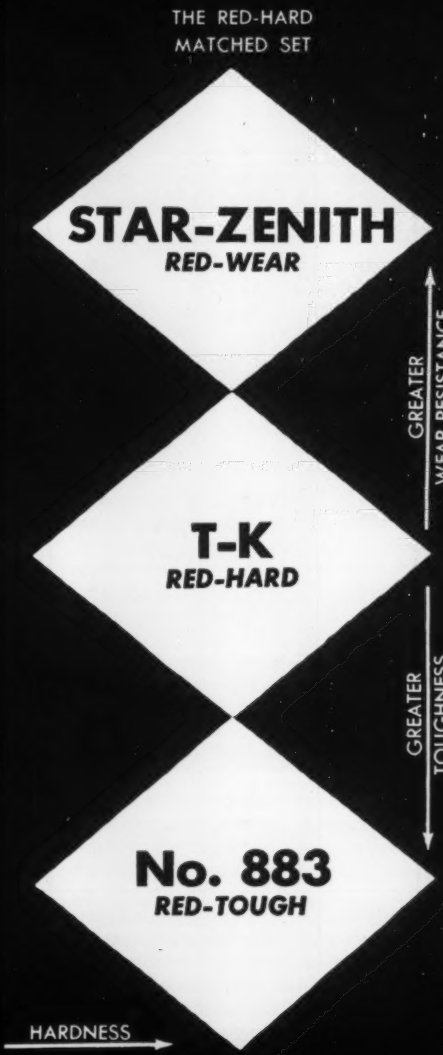

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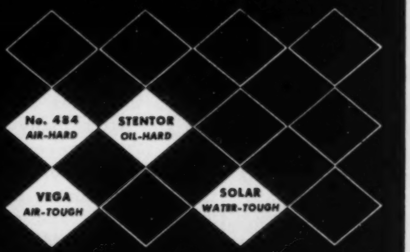

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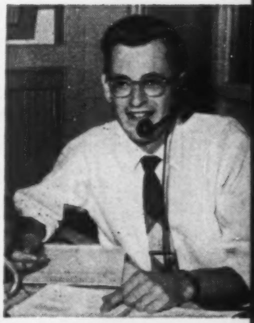

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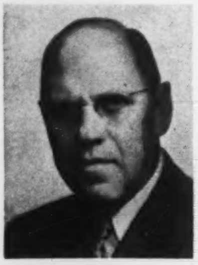

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EVERETT P. PARTRIDGE
Director, Hall Laboratories Inc. Pittsburgh

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Executive Vice President Harco Corp., Cleveland

RICHARD RUE
Technical Director, Insul-Mastic Corp. of America, Summit, Ill.

will also be in great need in the steel mill of tomorrow for two reasons: 1. The manufacture of steel is now almost a chemical process. 2. More steel plants are using the waste gases from the blast furnace for productive purposes.

Mr. Ytterberg . . .

Today's trend toward automation brings the problems of moving heavier loads over floor areas. Many plants are already bringing highway carriers to processing equipment. The trend toward larger, heavier loads also is reflected in in-plant handling, by heavier fork-truck and pallet loads.

The need for rugged, heavy-duty floors is evident. In 1956, many plants modernized floors with heavy-duty toppings, using granolithic absorption-process concrete. New plants are being designed so highway carriers can move into the plant.

Absorption-process floors are hard and have high compressive strength. Their safety surface resists chipping, gouging and marring. Precision metalworking equipment is especially sensitive to dust, so production and maintenance engineers will welcome the nondusting characteristics of heavy-duty floors.

Mr. Gallaway . . .

In its search for lower costs of production, industry has found that quality-designed and engineered personal safety equipment can be an important factor. The purpose of protective or safety equipment is to prevent job injuries or minimize the seriousness of accidents.

The Tillyer principle of adjusted lens correction, the ophthalmic standard for compensated vision, has been applied to safety glasses. The Tillyer corrective curve lenses are available in safety thickness which have been computed electronically.

Research and engineering also play a big part in the development of quality lines of respirators, safety gloves and clothing, and other personal protective equipment.

Mr. Partridge . . .

Tighter management of water is an immediate, practical step which can be taken in any plant. Few plants really know how much water is used in each operation, what changes in quality result and how water leaving one operation might be re-used in another.

Only where water has long been even more important than land, is a steel mill likely to carry internal re-use to the point of having no effluent because the final waste water is used for quenching coke. In any plant, control of the use of water and careful engineering of its re-use can ease a tightening water supply or water pollution.

To carry out his plans for the management of water, the engineer will need improved processes, materials and instruments. Chemicals to aid in the removal of suspended solids from water will continue to attract much attention during 1957. The effort to develop improved resins for ion exchange will accelerate. Recovery of usable water from brines by electrolytic desalting through ion-exchange membranes will continue to find the economic hurdles rougher than the technical ones. A new instrument for continuous measurement of dissolved oxygen in boiler feedwater may move from development into production.

Mr. Corlett . . .

Cathodic protection (prevention of corrosion by electrical means) is being widely accepted to preserve industrial process piping and underground utility lines as well as other buried or submerged metal structures.

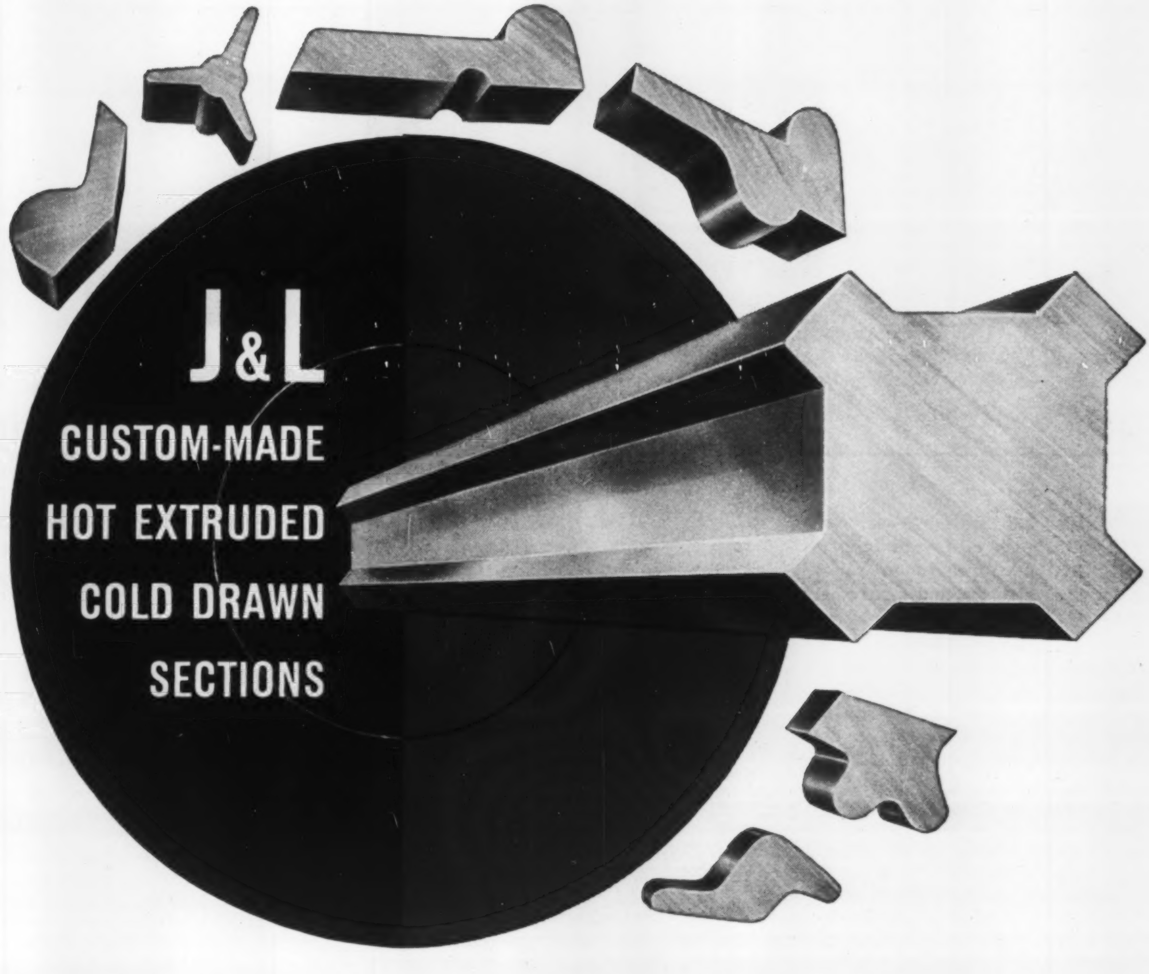
The high cost of labor and material for repair or replacement is eliminated. Production down time, damage to valuable products and contingent liabilities for hazards created by leaks are prevented.

Cathodic protection costs, measured against potential savings, will meet the most severe "pay-out" requirements of management. The effectiveness and economy of cathodic protection have long been recognized by the oil and gas industries. Other segments of industry are coming to realize that the reduction of expenditures for replacement will permit greater expenditures for new development and expansion.

Mr. Rue . . .

Don't overlook the polyester resin and glass cloth laminate systems. Plastic laminates are used to coat, line and patch many kinds of equipment. They are excellent from the standpoints of simplicity of application, safety during application, lasting protection and economy.

Plastic laminate resins are similar to the polyester resins used for sports



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JAMES W. WILCOCK
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R. T. PRING
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car bodies and boats. When combined with plies of inorganic glass cloth, they have proved to be exceptionally strong and extremely hard.

Because most of these materials are easily applied by brush and are self-curing at room temperature, they do not require equipment that might cause sparks or flames during application. They are ideal for repairing vessels and piping containing combustible materials and gases. These fast setting systems can be built to thicknesses of 50 mils or more.

Mr. Jensen . . .

Containers and covers for industrial storage batteries soon will be made from high-impact, hard rubber compounds. They will have six to eight times the impact resistance of present materials. The reliability of motive power batteries will be greatly increased because of the virtual elimination of cover and container breakage.

The use of the corrosion-resistant lead-calcium alloy in storage batteries, particularly for stationary industrial units, has increased life expectancy more than 40 per cent. It can be anticipated that the application of this alloy will be extended to other types of service, such as diesel-starting, open circuit stand-by power and certain types of batteries for cycle operation. Other corrosion-resistant grid alloys under development should also improve the life of batteries in certain types of service.

A still greater improvement in increased output for unit space and weight can be expected as improved component materials become available. Additional improvement in capacity for a given size also can be expected from new production methods which make more efficient use of battery-active materials than present methods do.

Mr. Vedder . . .

The demand for more effective control of industrial air pollution increases proportionately to its recognition by the public. From an industrial relations standpoint, modern management demands clean, pleasant conditions within the work place. Good community relations discourage the exhausting of fumes and dust into the surrounding atmosphere.

In the steel industry, control of effluents from such operations as melting furnaces, smelters, dryers, kilns, roasters and coolers is complicated by elevated temperatures, variations in gas volume, temperatures, dust loading and constituents and a predominance of fine particles difficult to capture.

Cleaning equipment developments have been confined principally to the improvement, refinement and modernization of basic types to increase over-all effectiveness and reduce operating and maintenance costs. In many industrial problems, the salvage value of recovered materials has contributed substantially toward returning the original investment.

Mr. Wilcock . . .

Metalworking is demanding bigger and more complex air handling equipment. Development projects are keyed to anticipated demands three, five and ten years from now, to insure that air handling systems keep pace with increased production in their ability to convey waste, supply fresh air, exhaust foul air and maintain optimum working conditions.

Electrostatic air cleaning is being added to industrial systems for worker health and equipment protection. Many steel mills use electrostatic equipment to filter the air entering motor rooms. Machine tool operations, critical gaging and assembly areas, and other industrial problems involving dirt-laden air are solved by high efficiency electronic air cleaning systems.

Industrial power generation and other heavy duty applications requiring mechanical draft type fans are increasing. The development of fans with volume and pressures unheard of five years ago provides the basis for successfully handling these applications.

Mr. Pring . . .

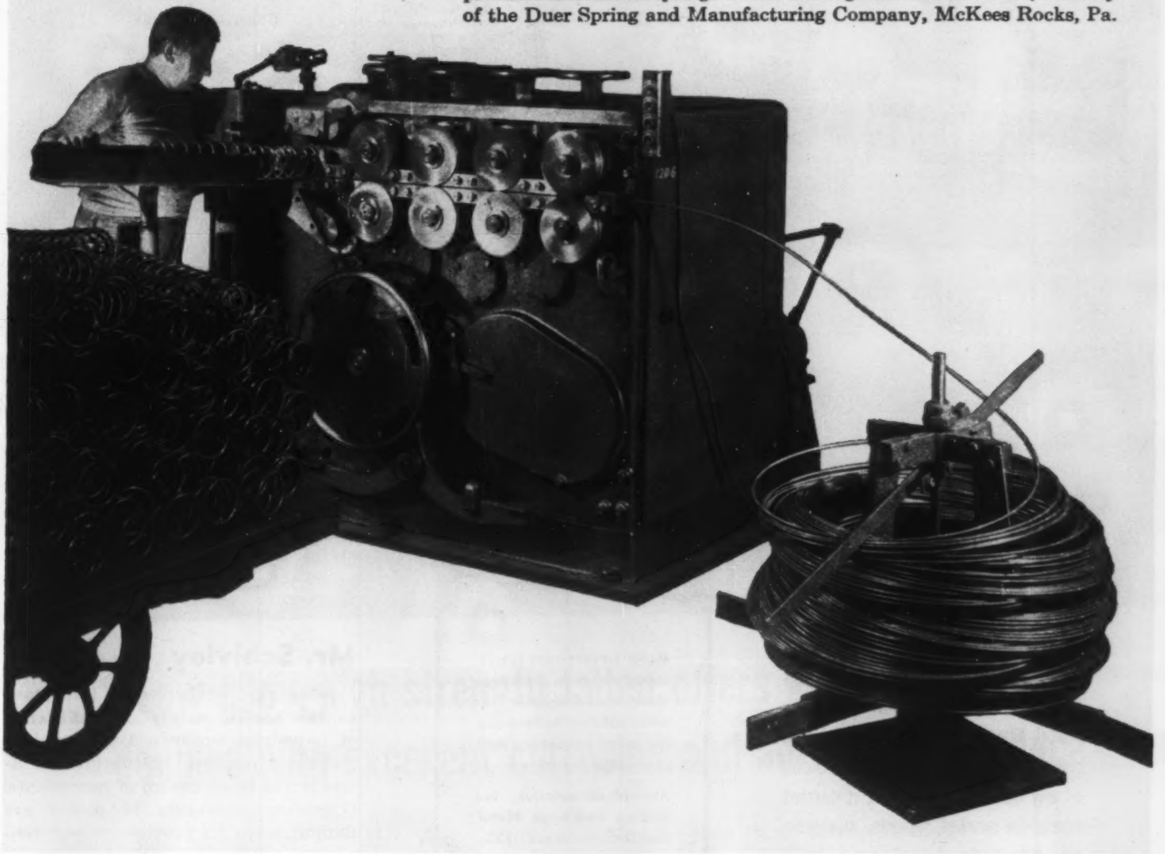
A partial solution to the air pollution problem caused by open hearth furnace stack gases is promised by a moving bed filter that uses a mat of slag wool. The unit is under test at a major steel company.

Many electric steelmaking furnaces have been equipped with fume control systems using cloth filtration and roof mounted hoods. Installations are limited mostly to smaller furnaces (below 15 ft in diameter), but the feasibility of direct furnace evacuation for larger units is under study.

Considerable interest is focused on a dry method for removing gaseous fluorides from furnace gases. Solid adsorbents are introduced into the flue system and removed from the gas stream in a dust collector, such as an electrostatic precipitator or cloth filter. Adsorbed fluorides also are removed.

Air pollution caused by the oxygen

J L
STEEL



Jones & Laughlin hard drawn MB spring wire, size .331″, is coiled into precision mechanical springs on this Torrington machine. Photo, courtesy of the Duer Spring and Manufacturing Company, McKees Rocks, Pa.

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WALTER L. DAVIDSON
Manager, General Sales Dept.
Machinery Div., Dravo Corp.
Pittsburgh

converter process for making steel is under investigation. The performance and economics of electrostatic precipitators, cloth type dust collectors and high efficiency, high energy scrubbers are being evaluated.

Mr. Schivley . . .

Adequate ventilation is important to the health, safety and efficiency of industrial workers. Designers are including modern ventilating facilities in the basic design of new plants. Operating managers of plants are finding ways to provide proper ventilating equipment to improve working conditions and operating results.

Among the newer tools for industrial air improvement are large capacity roof mounted propeller fans, which are sold as "package" units for easy installation. Multiple fan units, with or without heating coils, frequently supply air to replace that exhausted. They also have "package" construction.

Mr. Davidson . . .

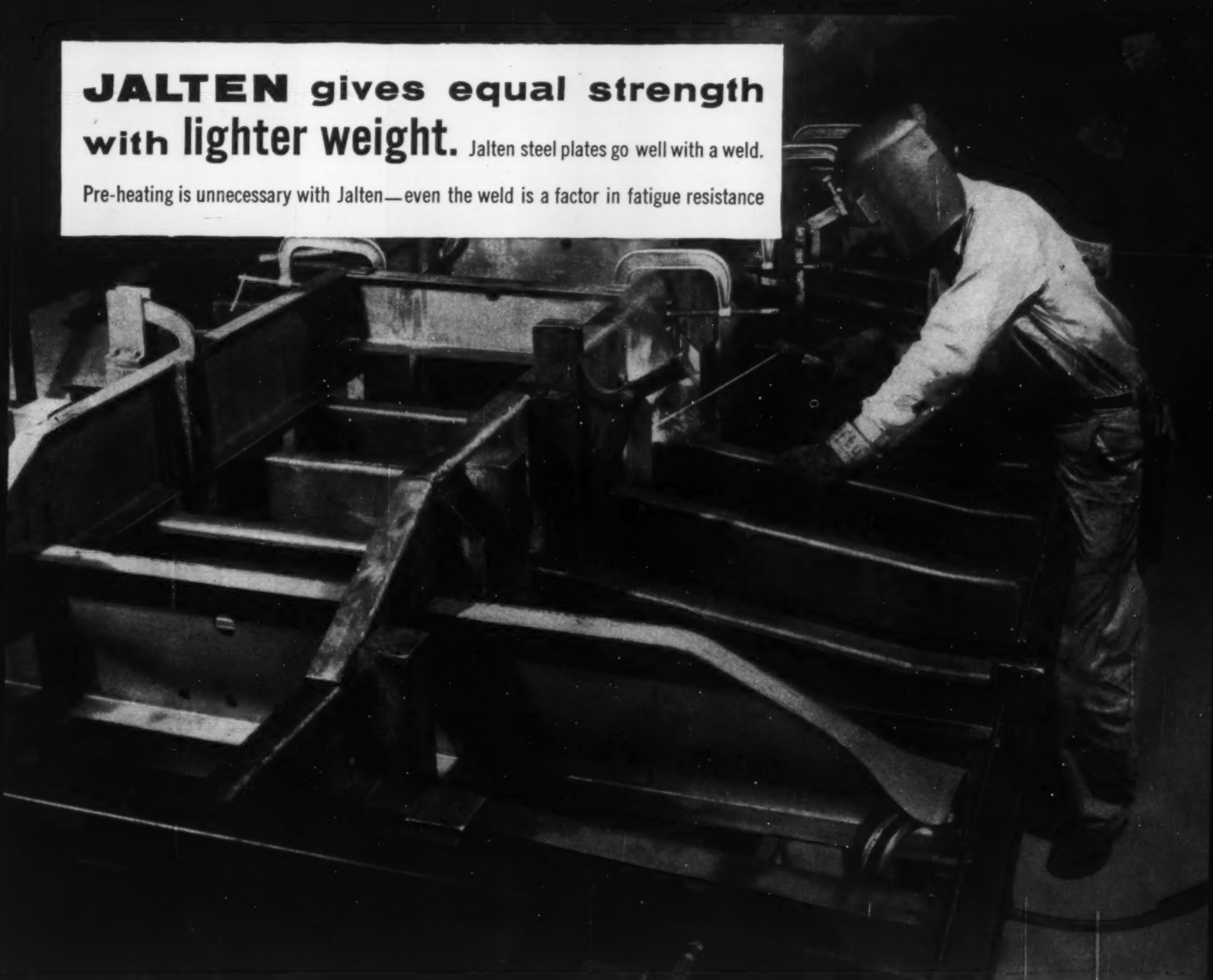
Improvements in forced air space heating equipment have led to more efficient combustion and air handling functions.

Use of stainless steel for the combustion chamber (the primary heat

JALTEN gives equal strength with lighter weight.

Jalten steel plates go well with a weld.

Pre-heating is unnecessary with Jalten—even the weld is a factor in fatigue resistance



Low alloy, high strength Jalten offers good formability coupled with excellent corrosion and abrasion resistance

Jalten's high strength permits high design loads. It also permits a reduction in section when used to replace mild steels. Usually the reduction amounts to two gages affording a weight savings of approximately 25 per cent. Thus, dead weight can be eliminated—resulting in increased carrying capacity. Also, it is easily welded.

Jalten is furnished in four grades:

No. 1—possesses high strength, good formability and fabricating qualities—good resistance to low temperature impact.

No. 2—offers high strength, moderate formability—improved resistance to atmospheric corrosion.

No. 3—gives high strength—improved resistance to abrasion.

No. 4—provides superior formability and surface quality for bumper stock applications requiring plating.

Jalten Steels are available as sheets, strip, plates, structurals, bars and small shape sections.

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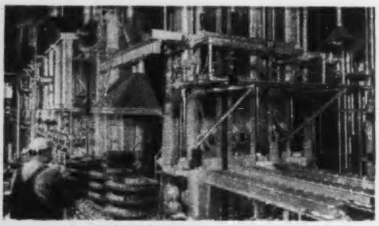
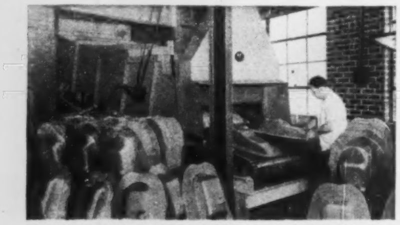
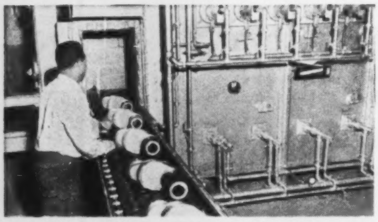

GAS CARBURIZING. An EF gas-fired radiant tube 3-row tray pusher special atmosphere continuous carburizing furnace.


BRIGHT ANNEALING. Dircharge end of an EF gas fired radiant tube installation with EF endothermic special atmosphere generator for bright annealing various sizes of stampings, uniformly and continuously. Other EF installations are handling stainless steel and other stampings.


SCALE FREE HEAT TREATING. This EF gas fired radiant tube installation with 3 heating zones, elevator type oil quench and a 2-station washing machine and rinsing equipment, scale-free hardens heavy aircraft motor parts, uniformly, automatically and continuously.

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transfer surface) has increased its resistance to buckling or warping under extreme temperatures. Air flow patterns have been improved, reducing the amount of horsepower needed for fans.

Secondary heat transfer surfaces (tubes that carry gases from the combustion chamber to exhaust stack) are being fabricated of aluminized steel which is resistant to high temperature corrosion.

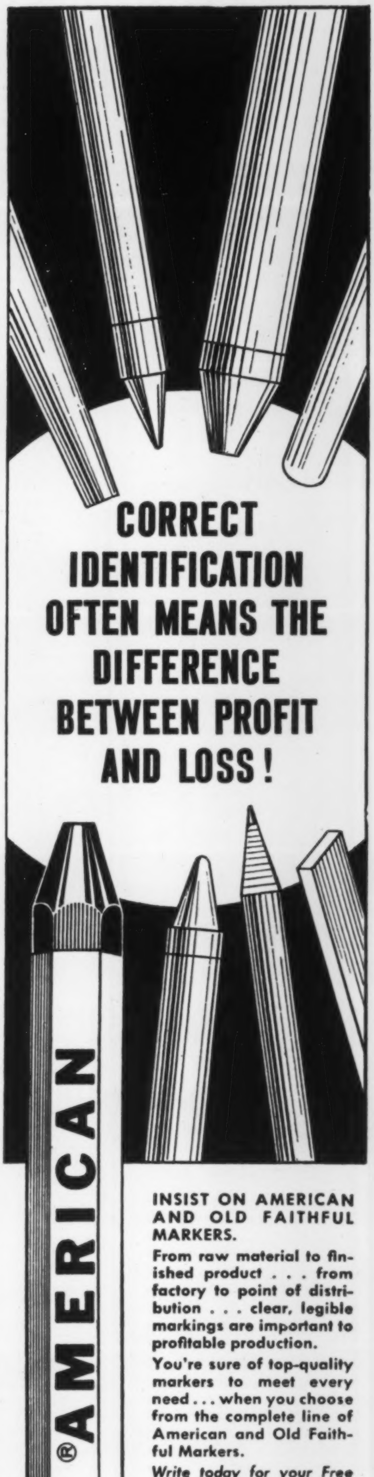
New types of inducted draft burners have been developed for automatic change-over between gas and oil firing.

Mr. Hognander . . .

Rider-type floor machines and sweepers have been developed for smaller feeder aisles to supplement work done by large units in main aisles. This trend is an outgrowth of rapid plant expansion, increased traffic and the insistence on higher maintenance standards.

Use of the small, compact machines has brought about design changes. Sweeping paths have been increased somewhat without materially changing machine body widths. Hydraulic dumping is fairly standard, and nonstop pickup of heavy debris and light soilage is a performance feature regarded as essential in most plants.

Operator-ridden machines also solve problems in personnel relations: They reduce fatigue; they enable a man to do a faster, cleaner job; they reduce air-borne dust and improve working conditions. More important, a rider-type machine tends to upgrade maintenance as a function: A machine operator feels more important than if he were using a scraper or broom.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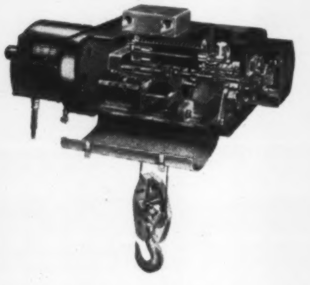

The Series "700" 'Load Lifter' has the fewest possible working parts to simplify maintenance. All units are easily accessible for inspection; the hoist can be serviced in the air. Down time is reduced — real economy for you.

This efficient motor-driven trolley provides effortless hoist travel at the push of a button. Available for Series "700" 'Load Lifter' Hoists already in service. New hoists can be so equipped before shipment; no additional assembly required.

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Lifting loads up to 15 tons on a heavy-duty cycle is a job for a tough hoist. The Series "700" 'Load Lifter' Electric Hoist more than meets every requirement in speed, stamina and safety. A ton can be lifted a foot a second. Extra ruggedness is built into every part to assure top performance under the worst conditions of service. The automatic load and motor brakes are interlocked to operate simultaneously, yet either brake *alone* can hold the full load safely. Only 24 volts at the pendant control is a plus in safety. Two-speed models provide a "low" that is 1/3 the speed of "high".

STEP DOWN cost per lift

The Series "700" 'Load Lifter' is available with lug or hook and push-type, hand-geared or motor-driven trolley. Learn how this husky electric hoist is saving time, effort and money in all kinds of plants, and how it can do the same for you. *Ask your "Shaw-Box" Distributor for details or write us for Bulletin 410.*

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1957 Calendar of Meetings

Jan. 12, American Electroplaters Society: Winter meeting, Sheraton Penn hotel, Pittsburgh. Society's address: 445 Broad St., Newark 2, N. J. Secretary: John P. Nichols.

Jan. 13-16, Institute of Scrap Iron & Steel Inc.: Annual meeting, Eden Roc and Fontainebleau hotels, Miami Beach, Fla. Institute's address: 1729 H St. N.W., Washington 6, D.C. Executive vice president: E. C. Barringer.

Jan. 14-18, Society of Automotive Engineers Inc.: Annual meeting, Sheraton-Cadillac and Statler hotels, Detroit. Society's address: 485 Lexington Ave., New York 17, N. Y. Secretary: John A. C. Warner.

Jan. 16-18, American Management Association: International management conference, Roosevelt hotel, New York. Association's address: 1515 Broadway, New York 36, N. Y. Secretary: Andrew P. Donovan.

Jan. 16-17, Caster & Floor Truck Manufacturers Association: Winter meeting, New Weston hotel, New York. Association's address: 27 E. Monroe St., Chicago 3, Ill. Secretary: H. P. Dolan.

Jan. 17-18, Steel Plate Fabricators Association: Annual meeting, Palmer House hotel, Chicago. Association's address: 79 W. Monroe St., Chicago 3, Ill. Secretary: J. Dwight Evans.

Jan. 18, Malleable Founders' Society: Semiannual meeting, Cleveland hotel, Cleveland. Society's address: 1800 Union Commerce Bldg., Cleveland 14, O. Managing director: Lowell D. Ryan.

Jan. 19-23, Truck-Trailer Manufacturers Association: Annual meeting, Del Coronado hotel, Coronado, Calif. Association's address: 710 Albee Bldg., Washington 5, D.C. Managing director: John B. Hulse.

Jan. 21-25, American Institute of Electrical Engineers: Winter general meeting, Hotel Statler, New York. Institute's address: 33 W. 39th St., New York 18, N.Y. Secretary: N. S. Hibshman.

Jan. 21-22, Solar Furnace Symposium: Westward Ho hotel, Phoenix, Ariz. Sponsor: Association for Applied Solar Energy, 3424 N. Central Ave., Phoenix, Ariz. Secretary: John I. Yellott.

Jan. 23-24, Steel Shipping Containers Institute Inc.: Winter meeting, St. Regis hotel, New York. Institute's address: 600 Fifth Ave., New York 20, N. Y. Secretary: L. B. Miller.

Jan. 24-26, National Tool & Die Manufacturers Association: Winter meeting, Biltmore hotel, Palm Beach, Fla. Association's address: 907 Public Square Bldg., Cleveland 13, O. Executive secretary: George S. Eaton.

Jan. 28-31, Associated Equipment Distributors: Annual meeting and exhibit, Conrad Hilton hotel, Chicago. Association's address: 30 E. Cedar St., Chicago 11, Ill. Executive secretary: P. D. Hermann.

Jan. 28-31, Plant Maintenance & Engineering Show & Conference: Public Auditorium, Cleveland. Information: Clapp & Poliak Inc., 341 Madison Ave., New York 17, N.Y.

Jan. 28-29, Industrial Heating Equipment Association Inc.: Annual meeting, Shoreham hotel, Washington. Association's address: Associations Bldg., Washington 6, D.C. Executive vice president: Carl L. Ipsen.

Jan. 28-Feb. 2, American Road Builders Association: Road show and convention, Congress hotel and International Amphitheatre, Chicago. Association's address: 600 World Center Bldg., Washington 6, D.C. Executive vice president: Louis W. Prentiss.

Feb. 4-6, American Management Association: Marketing conference, Hotel Statler, New York. Association's address: 1515 Broadway, New York 17, N.Y. Secretary: Andrew P. Donovan.

Feb. 4-8, American Society for Testing Materials: Committee week, Benjamin Franklin hotel, Philadelphia. Society's address: 1916 Race St., Philadelphia 3, Pa. Executive secretary: Robert J. Painter.

Feb. 7-8, American Management Association: Special conference on nucleonics in industry, Hotel Statler, New York. Association's address: 1515 Broadway, New York 36, N.Y. Secretary: Andrew P. Donovan.

Feb. 7-8, Malleable Founders' Society: Technical and operating conference, Wade Park Manor, Cleveland. Society's address: 1800 Union Commerce Bldg., Cleveland 14, O. Managing director: Lowell D. Ryan.

Feb. 11-13, Drop Forging Association: Winter meeting and exhibit, Edgewater Beach hotel, Chicago. Association's address: 419 S. Walnut St., Lansing 33, Mich. Secretary-treasurer: Richard Marcus.

Feb. 13-15, American Management Association: Mid-winter personnel conference, Palmer House, Chicago. Association's address: 1515 Broadway, New York 17, N.Y. Secretary: Andrew P. Donovan.

Feb. 24-28, American Institute of Mining, Metallurgical & Petroleum Engineers: Annual meeting, Roosevelt and Jung hotels, New Orleans. Institute's address: 29 W. 39th St., New York 18, N.Y. Secretary: E. O. Kirkendall.

Feb. 25-27, American Management Association: Annual special conference on electronics, Hotel Statler, New York. Association's address: 1515 Broadway, New York 36, N.Y. Secretary: Andrew P. Donovan.

Feb. 25-Mar. 1, International Heating & Air-Conditioning Exposition: International Amphitheatre, Chicago. Information: International Exposition Co., 480 Lexington Ave., New York 17, N.Y. President: E. K. Stevens.

Mar. 5-7, American Machine Tool Distributors Association: Spring meeting, El Mirador hotel, Palm Springs, Calif. Association's address: 1900 Arch St., Philadelphia 3, Pa. General manager: James C. Kelley.

Mar. 5-7, Society of Automotive Engineers Inc.: National passenger car, body and materials meeting, Sheraton-Cadillac hotel, Detroit. Society's address: 485 Lexington Ave., New York 17, N. Y. Secretary: John A. C. Warner.

Mar. 6-8, Pressed Metal Institute: Annual spring technical meeting, Carter hotel, Cleveland. Institute's address: 3673 Lee Rd., Cleveland 20, O. Managing director: H. A. Daschner.

Mar. 10-13, National Association of Waste Material Dealers Inc.: Annual convention, Conrad Hilton hotel, Chicago. Association's address: 271 Madison Ave., New York 16, N. Y. Managing director: Clinton M. White.

Mar. 11-15, Nuclear Congress: Convention Hall, Philadelphia. Co-ordinator: Engineers Joint Council, 29 W. 39th St., New York 18, N. Y.

Mar. 13-15, National Fluid Power Association: Annual meeting, Hollywood Beach Hotel, Hollywood, Fla. Association's address: 1618 Orrington Ave., Evanston, Ill. Executive secretary: Barrett Rogers.

Mar. 13-15, Radio-Eectronics-Television Manufacturers Association: Spring meeting, Sheraton Park hotel, Washington. Association's address: 777 14th St. N.W., Washington 5, D.C. Secretary: James D. Secrest.

Mar. 14-15, National Industrial Conference Board: Atomic energy conference, Benjamin Franklin hotel, Philadelphia. Board's address: 460 Park Ave., New York 22, N. Y. Secretary: Herbert S. Briggs.

Mar. 17-19, Steel Founders' Society of America: Annual meeting, Drake hotel, Chicago. Society's address: 606 Terminal Tower, Cleveland 13, O. Secretary: George K. Dreher.

Mar. 18-21, Society of the Plastics Industry Inc.: Annual national conference and plastics exposition, Biltmore hotel and Shrine Hall, Los Angeles. Society's address: 250 Park Ave., New York 17, N. Y. Executive vice president: William T. Cruse.

Mar. 20-22, Society of Automotive Engineers Inc.: National production meeting and forum, Hotel Statler, Buffalo. Society's address: 485 Lexington Ave., New York 17, N. Y. Secretary: John A. C. Warner.

Mar. 25-27, American Society of Tool Engineers: Annual meeting, Shamrock hotel, Houston. Society's address: 10700 Puritan Ave., Detroit 21, Mich. Executive secretary: Harry E. Conrad.

Mar. 25-29, Western Metal Congress & Exposition: Biennial exposition, Pan-Pacific Auditorium, Los Angeles. Information: American Society for Metals, 7301 Euclid Ave., Cleveland 3, O. Managing director: William H. Eisenman.

Mar. 25-29, American Society for Metals: Biennial technical meeting, Ambassador hotel, Los Angeles. Society's address: 7301 Euclid Ave., Cleveland 3, O. Managing director: William H. Eisenman.

Mar. 25-29, Society for Nondestructive Testing: Biennial technical meeting, Ambassador hotel, Los Angeles. Society's address: 1109 Hinman Ave., Evanston, Ill. Secretary: Philip D. Johnson.

Apr. 2-4, American Hot Dip Galvanizers Association Inc.: Annual meeting, Empress hotel, Miami Beach, Fla. Association's address: 1806 First National Bank Bldg., Pittsburgh 22, Pa. Secretary: Stuart J. Swensson.

Apr. 2-5, Society of Automotive Engineers: Aeronautic meeting and production forum and aircraft engineering display, Hotel Commodore, New York. Society's address: 485 Lexington Ave., New York 17, N. Y. Secretary: John A. C. Warner.

Apr. 9, Material Handling Institute: Spring membership and directors' meeting, Edgewater Beach hotel, Chicago. Institute's address: One Gateway Center, Pittsburgh 22, Pa. Managing director: R. Kennedy Hanson.

Apr. 7-10, National Screw Machine Products Association: Annual meeting, Shoreham hotel, Washington. Association's address: 2860 E. 130th St., Cleveland 20, O. Executive vice president: Orrin B. Werntz.

Apr. 8-10, American Institute of Mining, Metallurgical & Petroleum Engineers: Open hearth and blast furnace conference, William

Penn hotel, Pittsburgh. Institute's address: 29 W. 39th St., New York 18, N. Y. Secretary: E. O. Kirkendall.

Apr. 8-10, Metal Treating Institute: Spring meeting, Boca Raton hotel and club, Boca Raton, Fla. Institute's address: 271 North Ave., New Rochelle, N. Y. Executive secretary: C. E. Herington.

Apr. 8-12, American Welding Society: Spring technical, national meeting and welding show, Sheraton and Bellevue-Stratford hotels and Convention Hall, Philadelphia. Society's address: 33 W. 39th St., New York 18, N. Y. National secretary: J. G. Magrath.

Apr. 10-11, Industrial Truck Association: Spring meeting, Edgewater Beach hotel, Chicago. Association's address: 526 Washington Loan & Trust Bldg., Washington 4, D. C. Managing director: William Van C. Brandt.

Apr. 10-11, Malleable Founders' Society: Market development conference, Edgewater Beach hotel, Chicago. Society's address: 1800 Union Commerce Bldg., Cleveland 14, O. Managing director: Lowell D. Ryan.

Apr. 15-17, American Society of Lubrication Engineers: Annual meeting and exhibit, Sheraton-Cadillac hotel, Detroit. Society's address: 84 E. Randolph St., Chicago 1, Ill. Administrative secretary: William P. Youngclaus Jr.

Apr. 16-17, American Institute of Mining, Metallurgical & Petroleum Engineers: Metals conference, Carter hotel, Cleveland. Institute's address: 29 W. 39th St., New York 18, N. Y. Secretary: E. O. Kirkendall.

Apr. 23-25, Grinding Wheel Institute and Abrasive Grain Association: Spring meeting, Homestead, Hot Springs, Va. Information: Hunter-Thomas Associates, 2130 Keith Bldg., Cleveland 15, O.

Apr. 23-26, Steel Shipping Containers Institute Inc.: Annual meeting, Palm Beach Biltmore hotel, Palm Beach, Fla. Institute's address: 600 Fifth Ave., New York 20, N. Y. Secretary: L. B. Miller.

Apr. 24-26, American Zinc Institute and Lead Industries Association: Joint annual meeting, Drake hotel, Chicago. Information: 60 E. 42nd St., New York 17, N. Y. Secretary: Robert L. Ziegfeld.

Apr. 29-May 1, Association of Iron & Steel Engineers: Spring conference, Hilton Plaza hotel, Cincinnati. Association's address: 1010 Empire Bldg., Pittsburgh 22, Pa. Managing director: T. J. Ess.

Apr. 29-May 1, Chamber of Commerce of the U.S.: Annual meeting, Washington. Chamber's address: 1615 H St., N.W., Washington 6, D. C. Executive vice president: Arch N. Booth.

Apr. 29-May 3, National Materials Handling Exposition: Convention Hall, Philadelphia. Information: Clapp & Poliak Inc., 341 Madison Ave., New York 17, N. Y.

Apr. 30-May 1, Metal Powder Association: Annual meeting and exhibit, Drake hotel, Chicago. Association's address: 130 W. 42nd St., New York 36, N. Y. Secretary: Kempton H. Roll.

May 1-3, Society for Experimental Stress Analysis: Annual meeting, Hotel Statler, Boston. Society's address: P. O. Box 168, Cambridge 39, Mass. Secretary: W. M. Murray.

May 5-7, National Tool & Die Manufacturers Association: Spring meeting, Mayflower hotel, Washington. Association's address: 907 Public Square Bldg., Cleveland 13, O. Executive secretary: George S. Eaton.

May 6-10, American Foundrymen's Society: Annual meeting and first engineered castings show, Music Hall, Cincinnati. Society's address: Golf & Wolf Rds., Des Plaines, Ill. Secretary: William W. Maloney.

May 6-8, Air Conditioning & Refrigeration Institute: Annual meeting, Homestead, Hot Springs, Va. Institute's address: 1346 Connecticut Ave. N.W., Washington, D. C. Managing director: George S. Jones Jr.

May 7-12, National Association of Architectural Metal Manufacturers: Annual convention, Fairmont hotel, San Francisco, Calif. Executive secretary: William N. Wilson.

May 8-10, American Steel Warehouse Association: Annual meeting, Roosevelt hotel, New Orleans. Association's address: 442 Terminal Tower, Cleveland 13, O. Executive secretary: Robert G. Welch.

May 12-15, Automotive Engine Rebuilders Association: Annual convention, Sheraton-Cadillac hotel, Detroit. Association's address: 419 N. Capitol Ave., Indianapolis 4, Ind. Executive vice president: R. G. Patterson.

May 12-16, Electrochemical Society Inc.: Spring meeting, Hotel Statler, Washington. Society's address: 216 W. 102 St., New York 25, N. Y. Secretary: Henry B. Linford.

May 12-16, Rail Steel Bar Association: Annual meeting, Broadmoor hotel, Colorado Springs, Colo. Association's address: 38 S. Dearborn St., Chicago 3, Ill. Secretary: W. H. Jacobs.

May 13-16, American Mining Congress: Coal convention and exposition, Public Auditorium, Cleveland. Congress' address: 1102 Ring Bldg., Washington 6, D. C. Executive vice president and secretary: Julian D. Conover.

May 15-17, National Association of Sheet Metal Distributors: Spring meeting, Warwick hotel, Philadelphia. Association's address: 1900 Arch St., Philadelphia 3, Pa. Secretary: Thomas A. Fenley Jr.

May 15-17, Radio-Electronics-Television Manufacturers Association: Annual meeting, Sheraton hotel, Chicago. Association's address: 777 14th St. N.W., Washington 5, D. C. Secretary: James D. Secrest.

May 16-17, American Management Association: Special marketing conference, LaSalle hotel, Chicago. Association's address: 1515 Broadway, New York 17, N. Y. Secretary: Andrew P. Donovan.

May 16-17, National Industrial Conference Board: Annual meeting, Waldorf-Astoria hotel, New York. Board's address: 460 Park Ave., New York 22, N. Y. Secretary: Herbert S. Briggs.

May 19-22, Industrial Heating Equipment Association Inc.: Semiannual meeting, Homestead, Hot Springs, Va. Association's address: Associations Bldg., Washington 6, D. C. Executive vice president: Carl L. Ipsen.

May 20-23, Design Engineering Show: New York Coliseum, New York. Information: Clapp & Poliak Inc., 341 Madison Ave., New York 17, N. Y.

May 21-24, Machinery Dealers National Association: Annual meeting, Grossinger's hotel, Grossinger, N. Y. Association's address: 1346 Connecticut Ave. N.W., Washington 6, D. C. Executive director: R. K. Vinson.

May 22-23, American Iron & Steel Institute: Annual meeting, Waldorf-Astoria hotel, New York. Institute's address: 150 E. 42nd St., New York 17, N. Y. Secretary: George S. Rose.

May 22-24, American Society for Quality Control: Annual convention and exposition, Masonic Temple, Detroit. Information: Andrews, Bartlett & Associates Inc., 1849 W. 24th St., Cleveland 13, O.

May 26-29, National Association of Purchasing Agents: Annual meeting, Convention Hall, Atlantic City, N. J. Association's address: 11 Park Place, New York 7, N. Y. Secretary: George A. Renard.

May 27-28, American Institute of Steel Construction Inc.: Engineering conference, Edgewater Beach hotel, Chicago. Institute's address: 101 Park Ave., New York 17, N. Y. Executive vice president: L. Abbett Post.

June 2-7, Society of Automotive Engineers: Summer meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. Society's address: 485 Lexington Ave., New York 17, N. Y. Secretary: John A. C. Warner.

June 2-5, American Gear Manufacturers Association: Annual meeting, Homestead, Hot Springs, Va. Association's address: One Thomas Circle, Washington 5, D. C. Executive secretary: John C. Sears.

June 3-5, American Management Association: General management conference, Hotel Statler, New York. Association's address: 1515 Broadway, New York 17, N. Y. Secretary: Andrew P. Donovan.

June 4-7, National District Heating Association: Annual meeting, Homestead, Hot Springs, Va. Association's address: 827 N. Euclid Ave., Pittsburgh 6, Pa. Secretary-treasurer: John F. Collins Jr.

June 9-12, National Industrial Advertisers Association: Annual meeting, Waldorf-Astoria hotel, New York. Association's address: 271 Madison Ave., New York 16, N. Y. President: John C. Freeman.

June 9-12, National Metal Trades Association: Western plant management conference, Dell View hotel, Lake Delton, Wis. Association's address: 337 W. Madison St., Chicago 6, Ill. Secretary: Charles L. Blatchford.

June 10-11, Magnesium Association: Summer meeting, Homestead, Hot Springs, Va. Association's address: 122 E. 42nd St., New York 17, N. Y. Executive secretary: Jerry Singleton.

June 11-13, Western Plant Maintenance & Engineering Show: Civic Auditorium, San Francisco. Information: Clapp & Poliak Inc., 341 Madison Ave., New York 17, N. Y.

June 13-14, Malleable Founders' Society: Annual meeting, Broadmoor hotel, Colorado Springs, Colo. Society's address: 1800 Union Commerce Bldg., Cleveland 14, O. Managing director: Lowell D. Ryan.

June 14, Pressed Metal Institute: National sales conference for metal stampers, Carter hotel, Cleveland. Institute's address: 3673 Lee Rd., Cleveland 20, O. Managing director: H. A. Daschner.

June 14-16, Steel Kitchen Cabinet Manufacturers Association: Annual meeting, Greenbrier, White Sulphur Springs, W. Va. Association's address: 1008 Engineers Bldg., Cleveland 13, O. Executive secretary: Arthur J. Tuscany Jr.

June 16-17, National Association of Metal Finishers: Annual meeting, Sheraton-Mt. Royal hotel, Montreal, Que. Association's address: 60 Bently Rd., Cedar Grove, N. J. Secretary: P. Peter Kovatis.

June 16-21, American Society for Testing Materials: Annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. Society's address: 1916 Race St., Philadelphia 3, Pa. Executive secretary: R. J. Painter.

June 17-20, American Supply & Machinery Manufacturers Association: Annual meeting, Mark Hopkins hotel, San Francisco. Association's address: 2130 Keith Bldg., Cleveland 15, O. Business manager: W. B. Thomas.

June 19-22, Drop Forging Association: Annual meeting, Grand hotel, Mackinac Island, Mich. Association's address: 419 S. Walnut St., Lansing 33, Mich. Secretary-treasurer: Richard Marcus.

June 19-21, American Marketing Association: Annual meeting and exhibit, Hotel Statler, Detroit. Association's address: 27 E. Monroe St., Chicago, Ill. Executive director: William C. Gordon Jr.

June 16-20, American Electroplaters Society: Annual meeting, Sheraton Mt. Royal hotel, Montreal, Que. Society's address: 445 Broad St., Newark 2, N. J. Secretary: John P. Nichols.

June 23-25, Alloy Casting Institute: Annual meeting, Homestead, Hot Springs, Va. Institute's address: 32 Third Ave., Mineola, N. Y. Executive vice president: E. A. Schoefer.

June 24-28, American Institute of Electrical Engineers: Summer general meeting, Sheraton-Mt. Royal hotel, Montreal, Que. Institute's address: 33 W. 39th St., New York 18, N. Y. Secretary: N. S. Hibshman.

June 24-25, Wire Reinforcement Institute Inc.: Annual meeting, Greenbrier, White Sulphur Springs, W. Va. Institute's address: 1049 National Press Bldg., Washington 4, D. C. Managing director: Frank B. Brown.

June 24-29, Concrete Reinforcing Steel Institute: Annual meeting, Greenbrier, White Sulphur Springs, W. Va. Institute's address: 38 S. Dearborn St., Chicago 3, Ill. Managing director: H. C. Delzell.

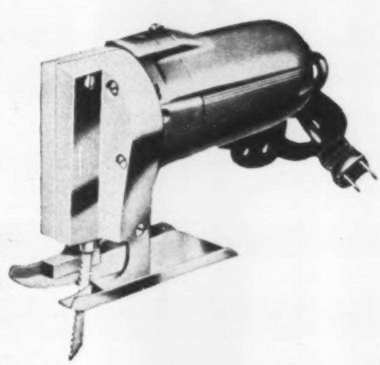
June 27-28, Refractories Institute: Annual meeting, Greenbrier, White Sulphur Springs, W. Va. Institute's address: 1801 First National Bank Bldg., Pittsburgh 22, Pa. Executive secretary: Avery C. Newton.

July 6-9, Automotive Engine Rebuilders Association: Summer meeting, Royal York hotel, Toronto, Ont. Association's address: 419 N. Capitol Ave., Indianapolis 4, Ind. Executive vice president: R. G. Patterson.

July 16-17, Truck-Trailer Manufacturers Association: Summer meeting, Homestead, Hot Springs, Va. Association's address: 710 Albee Bldg., Washington 5, D. C. Secretary: John B. Hulse.

July 24-27, National Tool & Die Manufacturers Association: Summer meeting, Grove Park Inn, Asheville, N. C. Association's address: 907 Public Square Bldg., Cleveland 13, O. Executive secretary: George S. Eaton.

Sept. 8-11, National Metal Trades Association: Eastern plant management conference,



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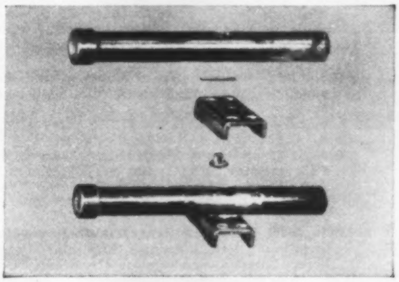

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Essex-Sussex hotel, Spring Lake, N. J. Association's address: 337 W. Madison St., Chicago 6, Ill. Secretary: Charles L. Blatchford.

Sept. 9-11, American Mining Congress: Metals mining and industrial minerals convention, Utah and Newhouse hotels, Salt Lake City, Utah. Congress' address: 1102 Ring Bldg., Washington 6, D. C. Executive vice president and secretary: Julian D. Conover.

Sept. 9-12, Society of Automotive Engineers: Tractor meeting and production forum, Hotel Schroeder, Milwaukee. Society's address: 485 Lexington Ave., New York 17, N. Y. Secretary: John A. C. Warner.

Sept. 9-13, Instrument Society of America: Annual meeting and show, Public Auditorium, Cleveland. Society's address: 313 Sixth Ave., Pittsburgh 22, Pa. Executive director: William H. Kushnick.

Sept. 12-14, Automotive Parts Rebuilders Association: Annual meeting and exhibit, Congress hotel, Chicago. Association's address: 220 S. State St., Chicago 4, Ill. Executive secretary: Jack O'Sullivan.

Sept. 17-20, American Die Casting Institute: Annual meeting, Edgewater Beach hotel, Chicago. Institute's address: 366 Madison Ave., New York 17, N. Y. Secretary: David Laine.

Sept. 18-20, National Industrial Conference Board: Marketing meeting, Waldorf-Astoria hotel, New York. Board's address: 460 Park Ave., New York 22, N. Y. Secretary: Herbert S. Briggs.

Sept. 21-24, Steel Founders' Society of America: Fall meeting, Homestead, Hot Springs, Va. Society's address: 606 Terminal Tower, Cleveland 13, O. Secretary: George K. Dreher.

Sept. 22-24, American Machine Tool Distributors Association: Annual meeting, Hotel Cleveland, Cleveland. Association's address: 1900 Arch St., Philadelphia 3, Pa. General manager: James C. Kelley.

Sept. 23-26, Association of Iron & Steel Engineers: Annual convention, Penn Sheraton hotel, Pittsburgh. Association's address: 1010 Empire Bldg., Pittsburgh 22, Pa. Managing director: T. J. Ess.

Sept. 26-27, American Hot Dip Galvanizers Association Inc.: Semiannual meeting, Netherland-Hilton hotel, Cincinnati. Association's address: 1806 First National Bank Bldg., Pittsburgh 22, Pa. Secretary: Stuart J. Swensson.

Sept. 29-Oct. 3, National Screw Machine Products Association: Fall membership meeting, Broadmoor hotel, Colorado Springs, Colo. Association's address: 2860 E. 130th St., Cleveland 20, O. Executive vice president: Orrin B. Werntz.

Sept. 29-Oct. 2, Packaging Machinery Manufacturers Institute: Annual meeting, Cloisters, Sea Island, Ga. Institute's address: 342 Madison Ave., New York 17, N. Y. Executive director: Russell L. Sears.

Sept. 30-Oct. 2, Industrial Truck Association: Fall meeting, Greenbrier, White Sulphur Springs, W. Va. Association's address: 526 Washington Loan & Trust Bldg., Washington 4, D. C. Managing director: William Van C. Brandt.

Sept. 30-Oct. 1, Material Handling Institute Inc.: Joint industry fall meetings, Greenbrier, White Sulphur Springs, W. Va. Institute's address: One Gateway Center, Pittsburgh 22, Pa. Managing director: R. Kennedy Hanson.

Oct. 1-5, Society of Automotive Engineers: Aeronautic meeting, aircraft production forum and aircraft engineering display, Ambassador hotel, Los Angeles. Society's address: 485 Lexington Ave., New York 17, N. Y. Secretary: John A. C. Warner.

Oct. 3-4, Refractories Institute: Fall meeting, Grand hotel, Point Clear, Ala. Institute's address: 1801 First National Bank Bldg., Pittsburgh 22, Pa. Executive secretary: Avery C. Newton.

Oct. 4-5, American Ceramic Society: Refractories division meeting, Bedford Springs hotel, Bedford, Pa. Society's address: 4055 N. High St., Columbus, O. Secretary: Charles S. Pearce.

Oct. 6-10, Electrochemical Society Inc.: Fall meeting, Hotel Statler, Buffalo. Society's address: 216 W. 102nd St., New York 25, N. Y. Secretary: Henry B. Linford.

Oct. 6-11, American Institute of Steel Construction Inc.: Annual meeting, Del Coronado hotel, Coronado, Calif. Institute's address: 101 Park Ave., New York 17, N. Y. Executive vice president: L. Abbett Post.

Oct. 6-11, American Trucking Associations Inc.: Annual meeting, Conrad Hilton hotel, Chicago. Association's address: 1424 16th St. N.W., Washington 6, D. C. General manager: Ray G. Atherton.

Oct. 7-9, American Society of Lubrication Engineers and American Society of Mechanical Engineers: Joint lubrication conference, Royal York hotel, Toronto, Ont. Information: 84 E. Randolph St., Chicago 1, Ill. Administrative secretary: William P. Youngclaus Jr.

Oct. 7-9, National Electronics Conference Inc.: Annual meeting and show, Sherman hotel, Chicago. Conference's address: 84 E. Randolph St., Chicago 1, Ill. Executive secretary: J. S. Powers.

Oct. 7-11, American Institute of Electrical Engineers: Fall general meeting, Morrison hotel, Chicago. Institute's address: 33 W. 39th St., New York 18, N. Y. Secretary: N. S. Hibshman.

Oct. 9-11, Gray Iron Founders Society Inc.: Annual meeting, Drake hotel, Chicago. Society's address: National City-E. 6th Bldg., Cleveland 14, O. Executive vice president: Donald H. Workman.

Oct. 12-17, Conveyor Equipment Manufacturers Association: Annual meeting, Grand hotel, Point Clear, Ala. Association's address: One Thomas Circle, Washington 5. D. C. Executive vice president: R. C. Sollenberger.

Oct. 12-17, Truck Body & Equipment Association Inc.: Annual meeting and exhibit, Atlanta-Biltmore hotel, Atlanta. Association's address: 1616 K St. N.W., Washington 6, D. C. Secretary: Arthur H. Nuesse.

Oct. 13-17, Pressed Metal Institute: Annual meeting, Castle Harbor, Bermuda. Institute's address: 3673 Lee Rd., Cleveland 20, O. Managing director: H. A. Daschner.

Oct. 14-16, Rail Steel Bar Association: Fall meeting, Western Hills hotel, Ft. Worth, Tex. Association's address: 38 S. Dearborn St., Chicago 3, Ill. Secretary: W. H. Jacobs.

Oct. 14-17, Wire Association: Annual convention and exhibit, LaSalle hotel, Chicago. Association's address: 453 Main St., Stamford, Conn. Executive secretary: Richard E. Brown.

Oct. 17-18, Magnesium Association: Annual convention, Biltmore hotel, New York. Association's address: 122 E. 42nd St., New York 17, N. Y. Executive secretary: Jerry Singleton.

Oct. 17-19, Foundry Equipment Manufacturers Association Inc.: Annual meeting, Greenbrier, White Sulphur Springs, W. Va. Association's address: One Thomas Circle, Washington 5, D. C. Secretary: C. R. Heller.

Oct. 20-23, American Hardware Manufacturers Association: National hardware convention, Marlborough-Blenheim hotel, Atlantic City, N. J. Association's address: 342 Madison Ave., New York 17, N. Y. Secretary-treasurer: Arthur L. Faubel.

Oct. 20-23, National Association of Sheet Metal Distributors: Annual meeting, Marlborough-Blenheim hotel, Atlantic City, N. J. Association's address: 1900 Arch St., Philadelphia 3, Pa. Secretary: Thomas A. Fernley Jr.

Oct. 21-25, National Safety Congress and Exposition: Conrad Hilton hotel, Chicago. Sponsor: National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill. Secretary: R. L. Forney.

Oct. 23-25, National Fluid Power Association: Fall meeting, Hotel Statler, Washington. Association's address: 1618 Orrington Ave., Evanston, Ill. Executive secretary: Barrett Rogers.

Oct. 27-30, American Gear Manufacturers Association: Fall meeting, Edgewater Beach hotel, Chicago. Association's address: One Thomas Circle, Washington 5, D. C. Executive secretary: John C. Sears.

Oct. 27-Nov. 1, Atomic Industrial Forum and American Nuclear Society: Annual meetings and 1957 Trade Fair of the Atomic Industry, Plaza hotel and New York Coliseum, New York. Information: Atomic Industrial Forum, 3 E. 54th St., New York 22, N. Y. Executive manager: Charles Robbins.

Oct. 28-30, Packaging Institute: Annual meeting, Hotel Statler, New York. Institute's address: 342 Madison Ave., New York 17, N. Y. Executive director: Charles A. Feld.

Oct. 28-31, National Industrial Packaging & Handling Exposition: Convention Hall, Atlantic City, N. J. Information: Hanson & Shea Inc., One Gateway Center, Pittsburgh 22, Pa.

Oct. 30-Nov. 1, National Association of Aluminum Distributors: Annual meeting, Camel Back Inn, Phoenix, Ariz. Association's address: 1900 Arch St., Philadelphia 3, Pa. Secretary: R. Bruce Wall.

Oct. 31-Nov. 2, National Metal Trades Association: Annual convention, Conrad Hilton hotel, Chicago. Association's address: 337 W. Madison St., Chicago 6, Ill. Secretary: Charles L. Blatchford.

Oct. 31-Nov. 3, National Tool & Die Manufacturers Association: Annual meeting, Edgewater Beach hotel, Chicago. Association's address: 907 Public Square Bldg., Cleveland 13, O. Executive secretary: George S. Eaton.

Nov. 1-3, Metal Treating Institute: Annual meeting, Sheraton hotel, Chicago. Institute's address: 271 North Ave., New Rochelle, N. Y. Executive secretary: C. E. Herington.

Nov. 2-8, American Society for Metals: Annual meeting, Palmer House, Chicago. Society's address: 7301 Euclid Ave., Cleveland 3, O. Managing director: William H. Eisenman.

Nov. 2-8, National Metal Exposition & Congress: International Amphitheatre, Chicago. Information: American Society for Metals, 7301 Euclid Ave., Cleveland 3, O. Managing director: William H. Eisenman.

Nov. 4-6, American Institute of Mining, Metallurgical & Petroleum Engineers: Institute of metals division meeting, Morrison hotel, Chicago. Institute's address: 29 W. 39th St., New York 18, N. Y. Secretary: E. O. Kirkendall.

Nov. 4-6, Society of Automotive Engineers: Transportation meeting, Hotel Statler, Cleveland. Society's address: 485 Lexington Ave., New York 17, N. Y. Secretary: John A. C. Warner.

Nov. 4-8, Society for Nondestructive Testing: Fall technical and annual meeting, Morrison hotel, Chicago. Society's address: 1109 Hinman Ave., Evanston, Ill. Secretary: Philip D. Johnson.

Nov. 6-8, Society of Automotive Engineers: Fuels and lubricants meeting, Hotel Statler, Cleveland. Society's address: 485 Lexington Ave., New York 17, N. Y. Secretary: John A. C. Warner.

Nov. 6-8, Grinding Wheel Institute and Abrasive Grain Association: Annual meeting, Sheraton-Blackstone hotel, Chicago. Information: Hunter-Thomas Associates, 2130 Keith Bldg., Cleveland 15, O.

Nov. 6-8, Scientific Apparatus Makers Association: Midyear meeting of laboratory apparatus and optical sections, Edgewater Beach hotel, Chicago. Association's address: 20 N. Wacker Dr., Chicago 6, Ill. Executive vice president: Kenneth Andersen.

Nov. 7-8, National Foundry Association: Annual meeting, Waldorf-Astoria hotel, New York. Association's address: 53 W. Jackson Blvd., Chicago. Executive secretary: Charles T. Sheehan.

Nov. 11-15, National Electrical Manufacturers Association: Annual meeting, Traymore hotel, Atlantic City, N. J. Association's address: 155 E. 44th St., New York 17, N. Y. Managing director: Joseph F. Miller.

Nov. 18-21, Air Conditioning & Refrigeration Exposition: Navy Pier, Chicago. Information: Clapp & Poliak Inc., 341 Madison Ave., New York 17, N. Y.

Dec. 1-6, American Society of Mechanical Engineers: Annual meeting, Hotel Statler, New York. Society's address: 29 W. 39th St., New York 18, N. Y. Secretary: C. E. Davies.

Dec. 2-6, Exposition of Chemical Industries: New York Coliseum, New York. Information: International Exposition Co., 480 Lexington Ave., New York 17, N. Y. President: E. K. Stevens.

Dec. 4-6, American Institute of Mining, Metallurgical & Petroleum Engineers: Electric furnace steel conference, William Penn hotel, Pittsburgh. Institute's address: 29 W. 39th St., New York 18, N. Y. Secretary: E. O. Kirkendall.

Dec. 5-7, National Association of Manufacturers: Congress of American Industry, Waldorf-Astoria hotel, New York. Association's address: 14 W. 49th St., New York 20, N. Y. Managing director: K. R. Miller.

This plant's stockpile is worth millions-- yet it doesn't cost a cent!

The "wild blue yonder"—the free and limitless atmosphere — is the stockpile for Air Products Oxygen (and/or Nitrogen) Generators. There are no delivery problems for this inexhaustible raw material. There are no price fluctuations and no shortages to trouble the owners of these plants.

The method is basic. The production of oxygen and nitrogen from air is accomplished by "Low-Temperature Processing". The air is liquefied by refrigeration and the nitrogen is drawn off at its boiling point (fractional distillation) leaving the pure oxygen product.

Your own "On-Location" Generator can provide you with a continuous supply of oxygen regardless of your requirements —including moderate to large tonnage users. We will furnish and install a complete facility at no capital investment on your part—on a lease basis including a purchase option. If you prefer, we will operate and maintain the facility and guarantee your oxygen savings.

Send us details regarding your requirements and expected future needs. We will then give you a realistic estimate of the savings you can expect with an Air Products Generator installed in your plant.

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Your SAVINGS start on the Drafting Board when you plan to use

GREATER UNIFORMITY—A must with today's high-speed automatic machine tools—it means less fixturing time, lower machine shop losses, and less balancing when required.

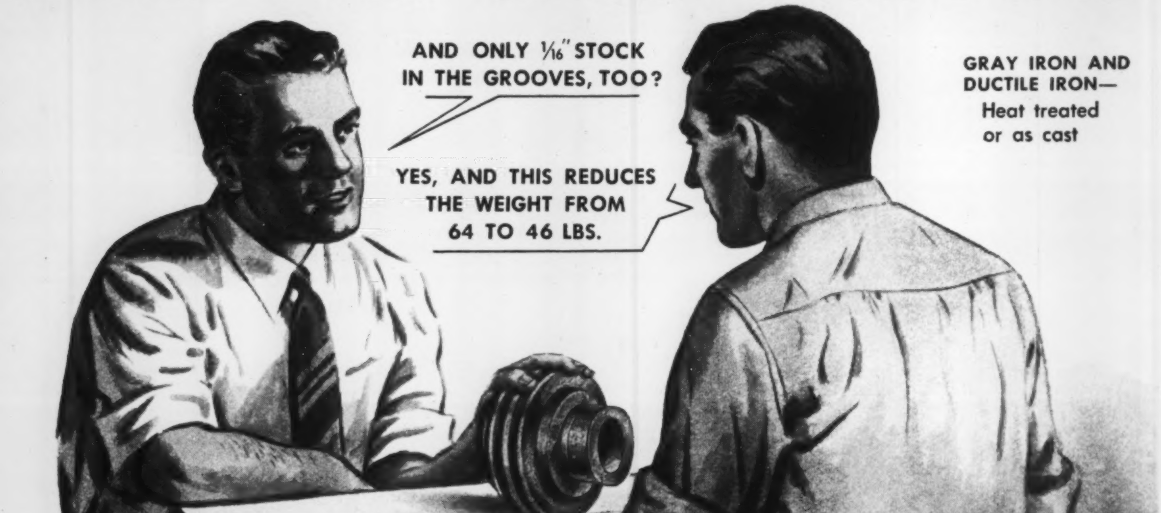
LESS MACHINING—Close control of dimensions means less machining, faster machining methods, or in some instances elimination of machining altogether.

MADE FOR LIGHT TRAVEL—Less machine stock means reduced weight—lowering transportation costs both in shipment and within the factory.

SUPERIOR SURFACE FINISH—Shell castings have "eye appeal"—their surface dresses up any finished product. Further, a smooth finish reduces wear on machine tools.

LYNCHBURG FOUNDRY

SHELL CASTINGS


AND ONLY 1/16" STOCK IN THE GROOVES, TOO?
YES, AND THIS REDUCES THE WEIGHT FROM 64 TO 46 LBS.
LFC

GRAY IRON AND DUCTILE IRON—
Heat treated
or as cast

No matter how huge the finished product, the importance of careful planning for each component part cannot be overemphasized. Savings really did begin at the drafting board stage when heavy road machinery designers specified Lynchburg Foundry shell molding for the sheave pictured above. They reasoned that if certain machining operations could be reduced or eliminated, considerable savings would result.

The use of shell molding in this application meant that finish stock was held to 1/16 inch compared to 1/8 inch or more when other casting methods were used. Further, shell mold cores were used to form the V-belt grooves, thus reducing the machining substantially. An added attraction of shell molding in this case was the fact that the reduced machine stock meant less weight and consequently lower shipping costs from foundry to factory.

Why don't you plan, from the very beginning, to use Lynchburg Foundry shell castings? Savings will be evident from the drafting board, to the assembly line, to the retailer's showroom, and most important, to the man who buys and uses your product.

LYNCHBURG FOUNDRY CO., Lynchburg, Virginia

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1956: YEAR OF EXPANSION

Noteworthy Industrial and Political Events That Affected Metalworking During the Past Year

January

AMERICAN industry starts new year with high employment, capacity operations, material shortages and extended backlogs. Automotive industry suffers a fast letdown from its 1955 pace.

First record of year: Annual capacity of the nation's steel mills is up 2,534,780 net tons. U.S. capacity hits 128,363,090 tons.

On Jan. 1 freight car builders have orders for 147,320 cars—ten times as many as they had a year ago.

Pinch on materials hurts industry. Copper, lead and zinc are in short supply. Plates are the most critical steel product, followed closely by structural shapes, sheets and bars.

Auto executives view future conservatively. Henry Ford II says he is "reasonably sure" that 1956 will not be as good as 1955 for his company.

Steel is the strong feature of the industrial scene. Production climbs to record 2,428,000 tons in the week ended Jan. 15. New marks are set in two following weeks (2,437,000 tons followed by 2,472,000 tons).

Benjamin F. Fairless, president of the American Iron & Steel Institute, says steel companies in the U.S. will add about 5 million tons to their capacity in each of the next three years.

Ford Motor Co. and Reynolds Metals Co. sign contract calling for Reynolds to deliver 640 million lb of aluminum over ten years. Reynolds will build reduction plant at Listerhill, Ala., and deliver molten metal to a new Ford foundry which will be built next to it.

Steel capacity rises

The New York Stock Exchange O.K.'s Ford's application for a listing. Scramble starts for 10.2 million shares at $64.50 a share.

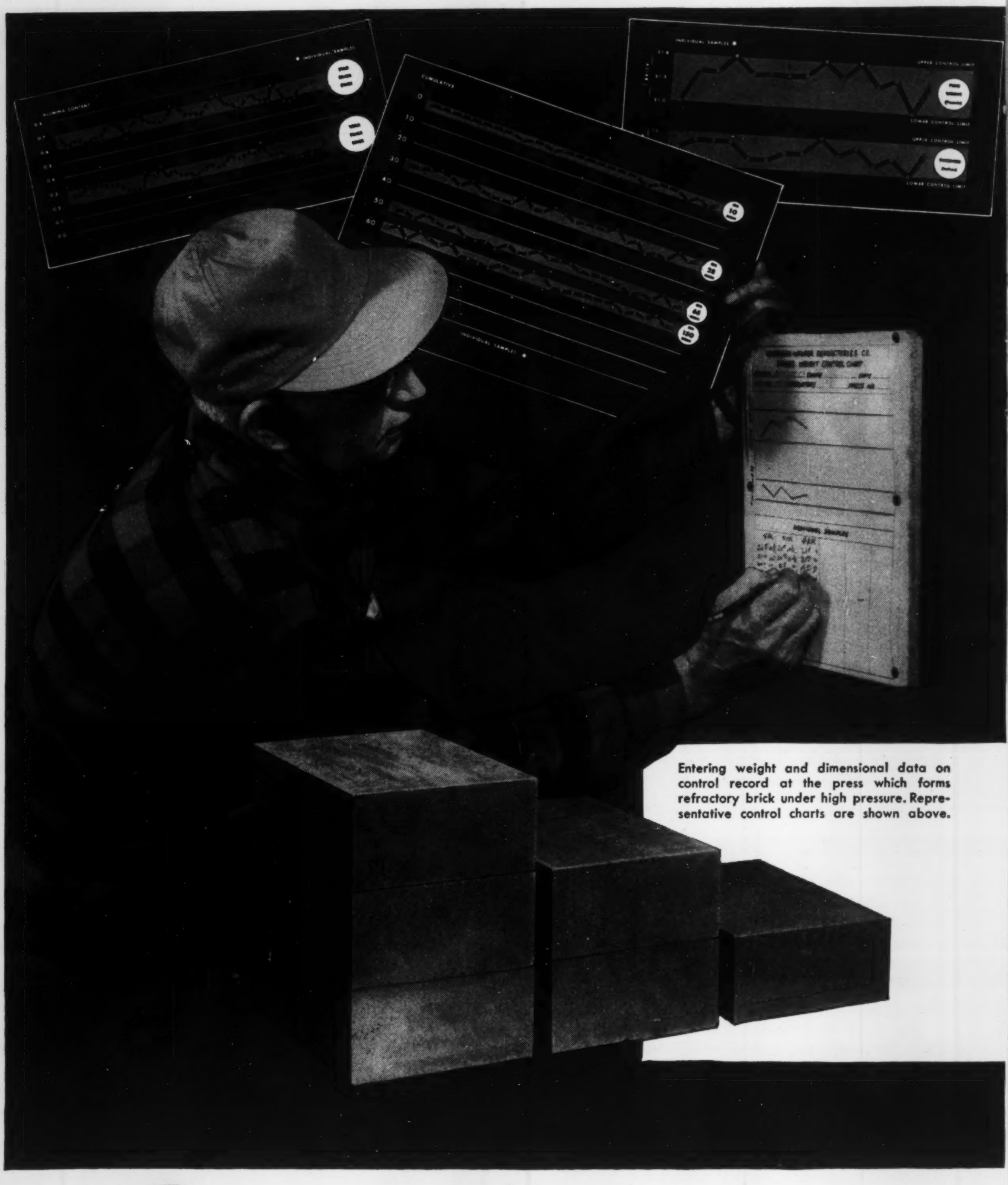
Jones & Laughlin Steel Corp., Pittsburgh, options iron ore deposit in northern Quebec which is estimated to contain 250 million tons of concentrates.

January begins and ends with cutbacks in the auto industry. Early in the month, Ford's Mercury division lays off 2450 assembly workers. At the end of the month, Chrysler Corp. trims production of Chryslers 14 per cent. General Motors Corp. follows with cuts. Stocks of new cars in dealers' showrooms total 800,000 at end of month.

Despite gloom in Detroit, employment reaches a January high—62.9 million, about 2.7 per cent higher than in January, 1955.

Febuary

AUTOMOTIVE cutbacks continue. Chrysler Corp. puts Detroit plants on a four-day week. Studebaker-Packard Corp. halts production of


CUMULATIVE
INDIVIDUAL SAMPLES
UPPER CONTROL LIMIT
LOWER CONTROL LIMIT

Entering weight and dimensional data on control record at the press which forms refractory brick under high pressure. Representative control charts are shown above.

HARBISON-WALKER REFRACTORIES COMPANY

AND SUBSIDIARIES

World's Most Complete Refractories Service

General Offices: **PITTSBURGH 22, PENNSYLVANIA**

QUALITY CONTROL—thorough and continuous—assures predictable and uniform *refractories performance* from Harbison-Walker products

Through Statistical Quality Control, Harbison-Walker maintains within closest commercial limits, the highest standards of all characteristics upon which depend the best and most uniform refractory service. Comprehensive control procedure extends from the raw materials through every manufacturing detail with the aid of instrumentation and precise laboratory testing. By this highly developed technique, uniformity of product is achieved which assures predictable and consistently uniform refractories performance. It is possible to estimate service life more accurately and plan furnace campaigns with confidence. With this established uniformity of quality, operating interruptions are fewer and maintenance costs are considerably reduced.

"Lump samples" of clay received from the mine are examined after test-firing.

Determining refractoriness by the "Pyrometric Cone Equivalent" method.

Screen analysis of Brick Mix is an important control operation.

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The program by which Harbison-Walker controls the properties and quality of the various refractories is described in detail in the new brochure *Better Refractories Through Quality Control*. It shows how uniformity is achieved and maintained in the refractories made from natural minerals from mines and quarries. A copy of this brochure will be gladly sent to you on request.

Better Refractories Through
Quality Control

HARBISON-WALKER REFRACTORIES COMPANY
Pittsburgh 22, Pennsylvania

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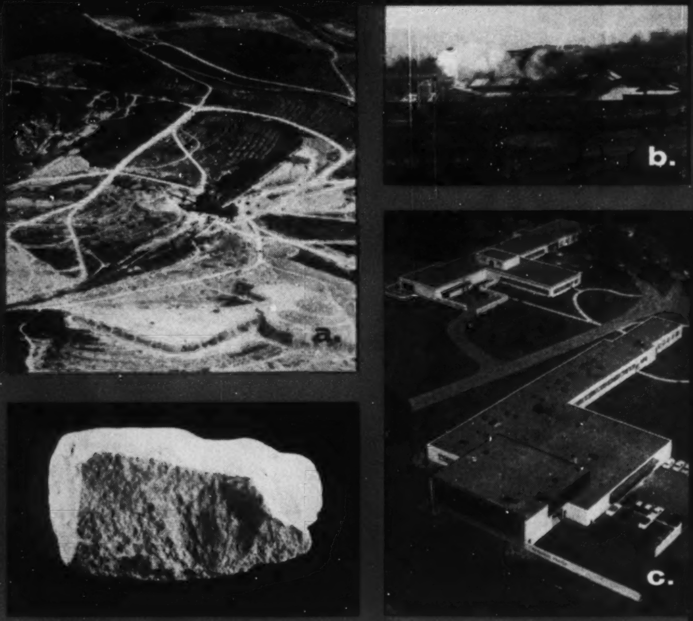

Steel is *big* . . . and suppliers of commodities to steel must be big, too. Chemstone's operations meet these requirements from three all-important standpoints:

a. THREE QUARRIES—the one shown above is 3,000 acres of purest limestone strata.

b. PLANTS—Strategically-located, high-capacity, modern facilities . . . an integrated plant-rail-dock-boat network . . . the kind of operation you can count on for fast, sure, on-schedule deliveries.

c. RESEARCH CENTER—where unceasing work goes on in the metallurgical application of fluxing limestones.

Chemstone—and its parent company—Minerals & Chemicals Corporation of America is geared to give steelmakers full service. We invite your inquiry.

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FLUXSTONE
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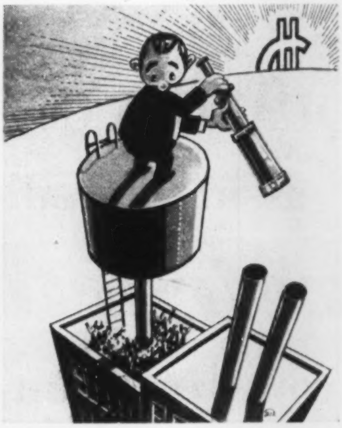

First-half prospects look good

Packards for two weeks. Unemployment in Detroit increases 40,000 in a month—100,000 are out of work there. Auto companies reduce purchases of steel.

A price increase of 15 to 20 cents a ton on soft coal is scheduled for Apr. 1.

President Eisenhower's doctors O.K. a second term.

Andes Copper Mining Co., a subsidiary of Anaconda Copper Mining Co., New York, plans to spend nearly $53 million to develop a new copper mine in Chile. Tight supplies force copper price to 46 cents a pound, the highest in 91 years.

Ford eliminates phantom freight charges by increasing base prices.

Chevrolet Division of GM buys land near Youngstown for 2.5 million sq-ft assembly plant. It will employ 8000 persons. Production is scheduled to start in fall of 1957.

Expansion program of Bethlehem Steel Co., Bethlehem, Pa., will cost about $300 million over the next two years—more than 3 million tons will be added to its annual steel ingot capacity. An additional $100 million will be spent on its share of the Erie Mining Co. taconite project.

Inland Steel Co., Chicago, schedules $75 million for expansion and improvement during the year.

Argentina receives a $60-million credit from the Export-Import Bank to help finance construction of an integrated steel mill.

The House Ways & Means committee votes to hold corporate taxes at 52 per cent for another year.

Another campaign issue is

THE MIDLAND STEEL PRODUCTS CO.
OWOSSO DIVISION

We've Room For Folks Like You . . .

Got a metalworking problem? Need additional engineering and production facilities to solve a bottleneck? If so, get in touch with us and let's talk about it. . . . We can probably help you because our new plant at Owosso, Michigan, was designed and equipped for just such additional business. In it we produce power brakes and other air controls used on trucks, trailers, buses, passenger cars, shovels, cranes, and industrial equipment of various types. We've got the know-how and wherewithal, however, to serve additional customers in the metalworking industry... We'll appreciate an opportunity to work with you if you have a problem. Just fill out and mail the coupon below.

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Owosso Division
The Midland Steel Products Company, Owosso, Michigan

☐ Please send us more information about your Owosso Division facilities.
☐ Please have a representative call on us.

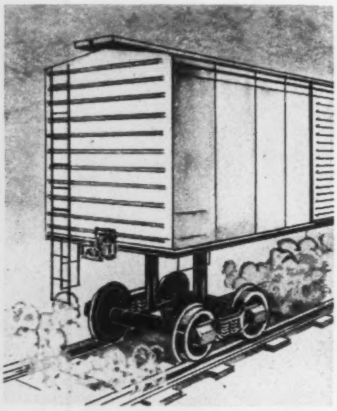
NAME________________________ TITLE____________________
COMPANY______________________________________
ADDRESS______________________________________
CITY________________________ STATE____________________

hatched as farm equipment makers prune production. President Eisenhower says he will run but rules out whistle stopping.

March

WAGE boosts go to about 2 million workers, most of them in the South, as employers bring pay rates up to the new federal minimum of $1 an hour.

The Interstate Commerce Commission grants railroads a 6 per cent increase in freight rates on most shipments. Vessel operators on the Great Lakes levy same increase on iron ore, coal and limestone shipments.



Freight rates are boosted

In London, copper prices peak at 54 cents a pound, a new high. U.S. producers hold at 46 cents, but custom smelters set prices at 53½-cents.

Youngstown Sheet & Tube Co., Youngstown, starts expansion program which will boost annual ingot capacity by 1 million tons. Cost: About $250 million.

Dow-Jones industrials cross 500 mark for first time. Utilities vault to their highest level in 25 years.

Westinghouse Electric Corp. and the International Union of Electrical Workers sign five-year contract to end 156-day strike. Strike loss is $290 million in business and $100 million in wages.

Kaiser Aluminum & Chemical Sales Inc., Oakland, Calif., boosts aluminum prices 1½-cents a pound across the board.

For the fourth week, steel scrap prices continue uptrend, pushing STEEL's price composite to a record $53.50 a ton. Steel production is 10,921,000 tons, the high for any month in history.

Machine tool backlogs soar to their highest mark since February, 1953. New orders for the month are $95.4 million—51 per cent more than was signed up in March, 1955.

Bookings for the material handling industry establish a high of 166.14 (1954 mean = 100). Bookings for the first three months average 139.38, compared with the 1955 average of 121.46.

General Electric Co. enjoys record profits and sales in first quarter. Sales of $946,458,000 were 14 per cent higher than those of same period in 1955. Profits were $53,962,000, 5 per cent above those in 1955's first quarter.

Less encouraging is the number of business failures for the month (1170 is the biggest total since March, 1941).

Durable inventories in manufacturers' hands pass their 1953 peak, hitting the $27-billion mark.

April

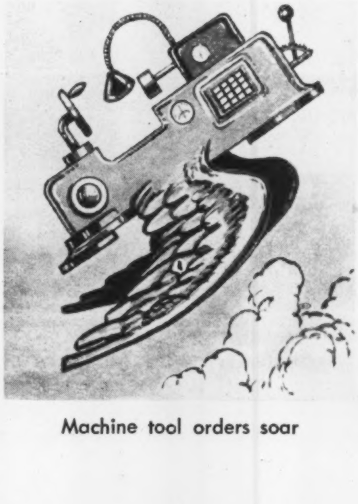
CONTINUING upswing in steelmaking scrap prices brings STEEL's composite to record $54.17 a ton. A week later, prices climb to $55.

Labor columnist Victor Riesel is blinded when assailant throws acid into his face.

Steel users eye oncoming steel negotiations, decide to play safe, start building inventories.

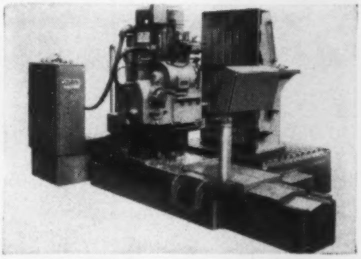
Steel mills operate at 100.9 per cent of capacity, turning out a record 2,483,000 tons in a week.

Aluminum Co. of America starts



Machine tool orders soar

(Advertisement)



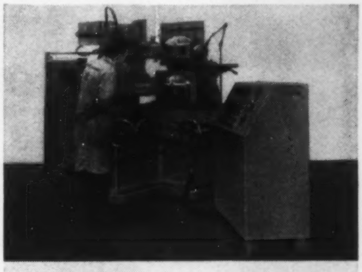
A P&W *Tracer-Controlled* MILLER FOR EVERY JOB

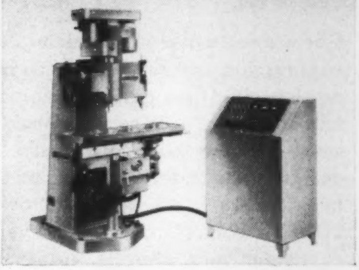
KELLER Type BG-21

. . . A powerful, versatile machine made in a range of sizes from 5′ x 2½′ to 10′ x 4′ in single spindle or 2-spindle models.

KELLER Type BL

. . . A compact powerful Tracer-Controlled Miller for work within the range of 36″ x 20″, with all the new KELLER features. Single spindle and 3-spindle models.



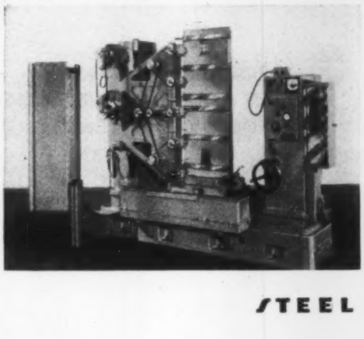


VELVETRACE®
Kellering Machine

. . . Duplicates the finest detail with extreme precision. New, non-contacting tracer accurately follows any 3-dimensional model without touching it. Cannot damage the softest, most fragile models.

Automatic Duplicating Machine

. . . Specially designed for low cost production of forging dies and molds for glass and plastic. Automatically re-produces original dies and molds with precision and remarkable detail. There are two versions of this machine, one for machining bottle molds, one for forging dies. Supplied with 1, 2 or 4 cutter spindles.



Still Running Fine, BUT

TODAY'S KELLERS WILL BRING EVEN GREATER PROFITS.

You may put off replacing an older machine because "it's still paying its way." But is it? A machine tool purchased years ago may be the cause of lost efficiency, higher labor and per-unit costs, the inability to produce high quality *economically*. Failure to compete profitably with more modern machines may be putting you far behind your competitors. For example, just 10 short years ago our Keller BG-2 Tracer-Controlled Miller was the ultimate in productive efficiency, but let's check the added features possessed by its successor, the new P&W BG-22 Keller . . .

1. Operates from any conventional polyphase current, with no motor generator set required.
2. Increased travel speed of cutting tool . . . to an infinitely variable range from 0.5 to 30.0 inches per minute.
3. Three dimensional tracer permits motion in 2 directions at the same time, yet allows interlocking action for accuracy. One slide is kept always in motion, while the second moves as required to follow the shape and maintain accurate interlocking action.
4. More nearly perfect surface cutting speed over irregular contours assured through superimposed auto-speed control of all motions.
5. Increased capacities . . . up to 20 feet horizontal x 7 feet vertical.
6. Centralized operator controls supplemented by remote control stations.
7. Rapid traverse in all three motions.
8. Automatic lubrication.
9. Score-proof phenolic bearing surfaces on all slides and lead screw nuts.

Write for complete information.

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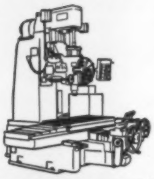

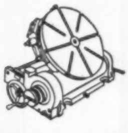

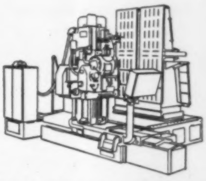

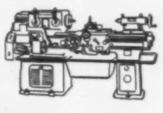

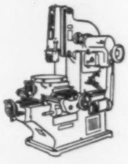

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FIRST CHOICE FOR ACCURACY

MACHINE TOOLS • GAGES • CUTTING TOOLS

work on a 150,000-ton smelting plant near Evansville, Ind. The $80-million project will boost Alcoa's capacity about 20 per cent.

Aluminium Ltd., Montreal, Que., says it will spend $250 million on a hydroelectric project in northern Quebec. It will support 150,000 tons of additional aluminum smelting capacity.

Strike closes Birmingham steel mills of Tennessee Coal & Iron Division, U.S. Steel Corp. Steel producers notify the United Steelworkers AFL-CIO that their agreement ends on June 30. The move is in line with Taft-Hartley provisions and is a defense against selective walkouts.

Employment reaches record levels. Nearly 64 million are at work —2.3 million more than employed in April, 1955.

Good business eludes auto industry. Government figures place industry's layoffs at 137,000. New car stocks are estimated at 900,000 units.

May

GENERAL Motors Corp. slashes Chevrolet production 10 per cent.

Auto production shrinks

Chrysler Corp. lays off 6200 Plymouth workers.

Westinghouse plans a $300-million expansion program for next five years. Heavy equipment and consumer products will share equally in the growth.

Aluminum Co. of America estimates expansion costs for the next five years at $600 million.

Kaiser Steel Corp., Oakland, Calif., plans expenditure of $113 million to boost the output of its Fontana, Calif., mill by 40 per cent. U.S. Steel will spend $500 million a year for the next ten years to increase its ingot capacity 1 million tons annually. Roger M. Blough, chairman, says expansion costs will require $150 million. Replacement of equipment will involve $350 million.

Titanium Metals Corp. of America, puts price of $3.25 a pound on titanium sponge, a 20 per cent cut.

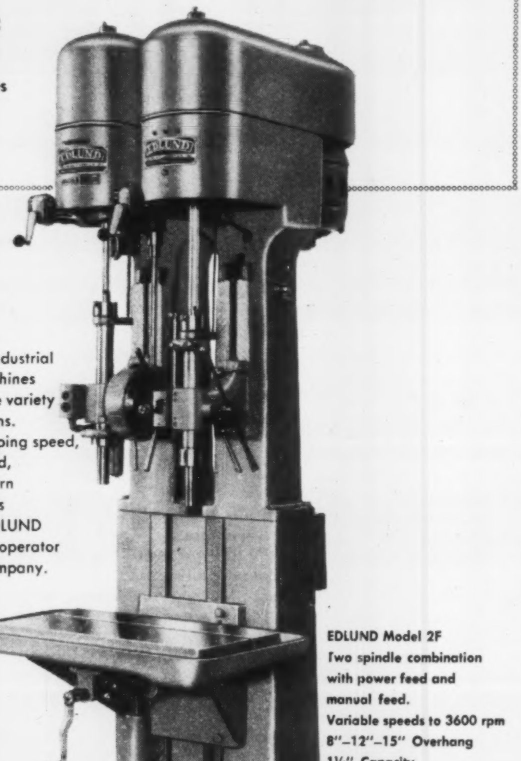
GM's president, Harlow Curtice, revises his estimate of domestic demand for cars downward (to 5.8 million for 1956). His estimate in January was 6.5 million. Mr. Curtice blames "the restrictive credit policy of the Federal Reserve Board, rumors of revolutionary '57 cars and predictions of early model introduction dates."

Negotiations on new steel contracts start.

Employment is at record May

EDLUND AMERICA'S MOST VERSATILE DRILLING MACHINE

EDLUND Model 2F
Infinitely Variable Speed
Modern Production Features
Long Lasting—
Rugged Construction



The changing pattern of industrial production requires machines readily adaptable to a wide variety of production problems. Selection of any drilling or tapping speed, manual or power feed, and many other modern production accessories make operation of the EDLUND Model 2F a pleasure for the operator and good sense for the company.

Write for Bulletin 140R.

EDLUND Model 2F
Two spindle combination with power feed and manual feed.
Variable speeds to 3600 rpm
8"–12"–15" Overhang
1¼" Capacity

EDLUND Representatives in Major Cities

EDLUND MACHINERY COMPANY
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Division of Hortup Corporation

Write for Bulletin G56 — Complete Line with Cam Feed Units
Bulletin 160 — Model 1F–High Speed
Bulletin 170R— Model 4F–Production

Pittsburgh moves ahead . . . underground

Dravo men, working day and night, are punching out a 10-mile long tunnel some 100 feet under Pittsburgh. Their job is part of a main interceptor line in the Allegheny County Sanitary Authority's $80 million sewage system program—a vital step in Pittsburgh Renaissance.

Working from three separate access shafts, crews are blasting through sandstone and shale to connect the various sections. At 57 other locations in the city, Dravo is constructing downshafts which will serve as diversion structures to feed sewage into the tunnel.

Projects of this magnitude are daily fare for Dravo. Other heavy construction activities include docks for industries; dam and locks on the inland waterways; piers for a bridge over the Mississippi River; a complete dock and harbor for ore boats in Lake Superior. Shown below are some of the many other specialized services and products Dravo has furnished to business and industry for more than 65 years. DRAVO CORPORATION, PITTSBURGH 25, PENNSYLVANIA.

DRAVO
CORPORATION

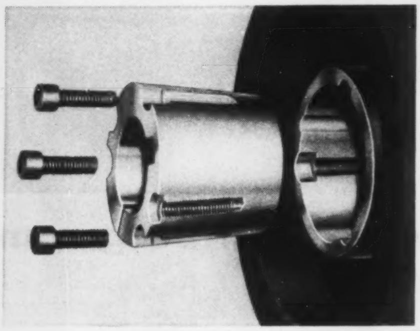
Blast furnace blowers · boiler & power plants · bridge sub-structures · cab conditioners · docks & unloaders · dredging · fabricated piping

foundations · gantry & floating cranes · gas & oil pumping stations · locks and dams · ore & coal bridges · process equipment · pumphouses & intakes

river sand and gravel · sintering plants · slopes, shafts, tunnels · space heaters · steel grating · towboats, barges, river transportation

68

LEADING MANUFACTURERS ARE LICENSED BY DODGE TO MANUFACTURE TAPER-LOCK HUBS FOR USE IN THEIR PRODUCTS OR PLANTS



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The Taper-Lock method of mounting wheels to shafts has been adopted as standard in thousands of plants. With 68 licensees incorporating Taper-Lock in their products, such standardization is becoming more and more universal . . . The Taper-Lock bushing mounts flush. No flange, no collar, no protruding parts. Easy on, easy off. Taper-Lock holds with the firmness of a shrunk-on fit. ONE bushing fits sprockets, sheaves, couplings and pulleys—both timing-belt and conveyor . . . See your Dodge Distributor or write us for the full story.

DODGE MANUFACTURING CORPORATION
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MANUFACTURER OF MODERN POWER TRANSMISSION MACHINERY AND ORIGINATOR OF TAPER-LOCK

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Sub. Cos. Bethlehem Steel Corp., Bethlehem
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The Brewster Co., Inc., Shreveport
Chain Belt Company, Milwaukee
Chicago Pneumatic Tool Co., New York
The Cleveland Worm & Gear Co., Cleveland
Cocker Machine & Foundry Company, Gastonia
Colmant-Cuvelier, Lille, France
Continental Can Co., Inc., New York
Crucible Steel Co. of America, Pittsburgh
Dexter Folder Company, Pearl River
Diamond Chain Co., Inc., Indianapolis
The Duraloy Company, Scottdale
Ericsson Merritt, Inc., Lockport
Fairmont Railway Motors, Inc., Fairmont
J. H. Fenner & Co., Ltd., Marfleet, England
J. H. Fletcher & Co., Huntington
Foremost Machine Builders, Livingston
The Fuller Brush Co., Hartford
The Goodman Mfg. Co., Chicago
Gould Paper Co., Lyons Falls
Hammond Laundry Cleaning Mach. Co., Waco
Hetherington and Berner Inc., Indianapolis
Humphrey and Sons Co., Joliet
Illinois Gear & Machine Co., Chicago
Imperial Paper and Color Corp., Glens Falls
Industrial Specialties Co., Pawtucket
Iowa Manufacturing Co., Cedar Rapids
The Jeffrey Manufacturing Co., Columbus
Jones Machinery Division,
 Hewitt-Robins Inc., Chicago
Kallay Gear Works, Inc., Bridgeport
The Karl Kiefer Machine Co., Cincinnati
Keyes Fibre Company, Waterville
Lamson Corporation, Syracuse
E. P. Lawson Co., Inc., New York
Link-Belt Company, Chicago
The Long Company, Oak Hill
Loper Machine Works, Monroe
Lovejoy Flexible Coupling Co., Chicago
J. W. Minder Chain & Gear Co., Los Angeles
Morse Chain Company, Detroit
Niagara Chemical Division,
 Food Machinery & Chemical Corp., Middleport
Oil Well Supply Division,
 United States Steel Corp., Dallas
Porter-Way Harvester Manufacturer, Waterloo
Potter & Johnston Co., Pawtucket
Prager Incorporated, New Orleans
Proctor & Schwartz, Inc., Philadelphia
Ramsey Chain Company, Inc., Albany
Robert Reiner, Inc., Weehawken
R. J. Reynolds Tobacco Co., Winston-Salem
St. Regis Paper Company, New York
Shenango-Penn Mold Co., Dover
Sonntag Scientific Corporation, Greenwich
Standard Steel Spring Div., New Castle
Stranahan Gear Co., Inc., Philadelphia
M. H. Treadwell Company, Inc., New York
The Union Chain & Mfg., Co., Sandusky
United States Rubber Co., Philadelphia
J. A. Vance Co., Winston-Salem
Warner Electric Brake & Clutch Company, Beloit
The Waterman-Western Company, Exeter
Webster Manufacturing, Inc., Tiffin
Whitewater Manufacturing Co., Whitewater
The Whitney Chain Company, Hartford

level of 65 million. Only 2½-million are unemployed.

June

UNEMPLOYMENT in the automotive industry idles 210,000.

The Office of Defense Mobilization issues 110 certificates for fast tax amortization on over $540 million worth of proposed railroad freight cars, tank cars and diesel locomotives.

President Eisenhower has an operation for ileitis.

Steel companies offer union a five-year, no-strike contract. It provides more pay and Guaranteed Annual Wage, but talks deadlock.

The United Mine Workers of America, coal producing companies and coal-carrying railroads form $50-million corporation called American Coal Shipping Inc. It plans to obtain ships to carry coal to Europe.

The Commerce department clamps embargo on exports of all nickel-bearing scrap materials for the third quarter.

Congress passes bill providing for a $33-billion road building program. It also hikes taxes on gasoline, tires and trucks.

United Steelworkers sends out strike instructions. Steel producers reject union offer to extend existing pacts. Companies object to retroactive provisions union wants.

Jones & Laughlin Steel Corp., Pittsburgh, plans integrated 1-million ton steel mill near Houston. Cost is estimated at $300 million. The primary finished product will be pipe for the oil industry.

Living costs reach new peak—116.2 per cent on the government index (1947-49 = 100). Employment sets record, too. Nation has 66.5 million at work.

Production of 62,607,611 net tons of ingots in the first six months sets a half-year record. Auto production is only 3.2 million, nearly 25 per cent less than last year's.

Government balances its budget for the first time in five years. Surplus in the fiscal year ending June 30 is $1.7 billion.

U.S. balances budget

July

STEEL STRIKE shuts down nearly 90 per cent of the nation's ingot making capacity. About 18 million to 20 million tons of finished steel are in inventory (steel inventories have been increasing monthly for about a year). These stocks would last three months if they were evenly distributed. They aren't. The auto industry is thought to have the biggest inventory, a large portion in cold-rolled sheets. Structural shapes and plates (thicker sizes especially) are in woefully short supply.

Railroad layoffs are first to follow the steel strike. Soft coal mines are next. Supplies of ore for shipment down lakes are exhausted quickly.

Attorney General Herbert Brownell Jr. says Justice department will file antitrust suit against General Motors Corp. for having an alleged monopoly in busmaking. Government claims GM has 85 per cent of market.

Dravo Corp., Pittsburgh, announces it will erect an iron ore sintering plant with a capacity of 2400 tons a day. The place: Armco Corp.'s Ashland, Ky., works.

U.S. withdraws its offer to help Egypt build Aswan dam. Egypt seizes Suez canal one week later.

Government plans to pay premium prices to increase annual nickel supplies available to the U.S. from 300 million to 440 million lb by 1961.

Gear sales index of the American Gear Manufacturers Association hits record 287.6 (1947-49 = 100). Backlogs are about three times normal.

Living costs and employment attain record levels. (66.7 million are

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DIAMOND D
CLUTCHES

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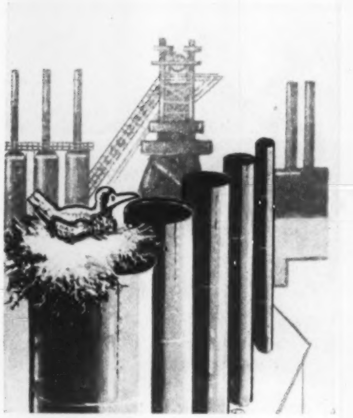
at work. Prices are 117 per cent of 1947-49 level.)



Strike idles steel mills

Strike-breaking steel labor agreement covers three years: It provides: Average wage increases of 10.5 cents an hour first year, 9.1 cents in each of the next two, a layoff pay plan, cost-of-living increases, premium pay for Sundays, the union shop, another paid holiday, higher premium pay for shift work and holidays, increased pension and insurance benefits, jury pay and higher vacation pay.

August

FARM tractor production at Rock Island, Ill., and Louisville is halted by International Harvester Co. "for at least five weeks."

United Steelworkers strikes 12 plants of Aluminum Co. of America, nine of Reynolds Metals Co.'s.

U.S. Steel boosts prices an average of $8.50 a ton as final contract signing sends 650,000 steelworkers back to mills. Production of about 10 million tons of steel ingots is lost during the strike. New prices will cost metalworking companies an additional $275 million to $300 million this year.

Resumption of ore hauling by the 58-boat fleet of U.S. Steel's Pittsburgh Steamship Division is held up by strike of two maritime unions seeking recognition.

Alcoa settles its strike, increases prices of aluminum pig 1 cent a pound.

Adlai Stevenson wins Democratic presidential nomination on the first ballot despite a prediction by former President Harry S. Truman

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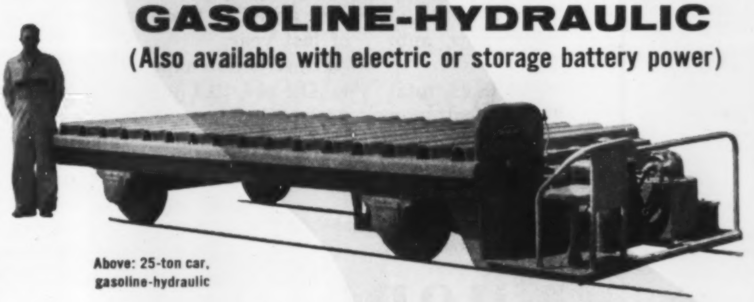
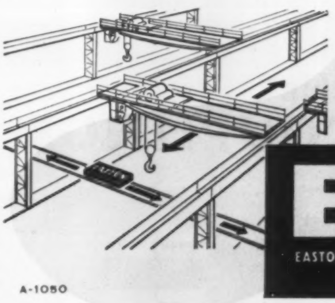


Above: 25-ton car, gasoline-hydraulic



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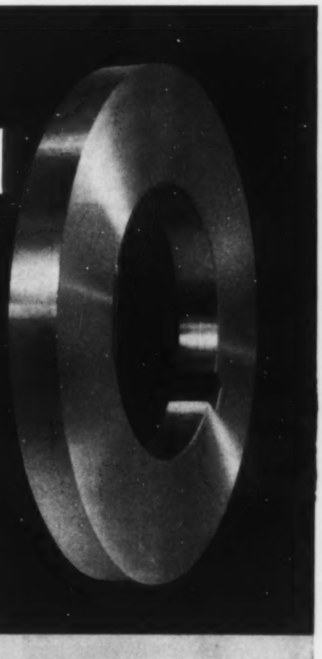

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that he can't win the election. A week later, President Eisenhower receives the acclamation of the Republican delegates. Vice President Richard M. Nixon steamrollers Joe Smith.

Metallurgical coke producers up prices $2 a ton.

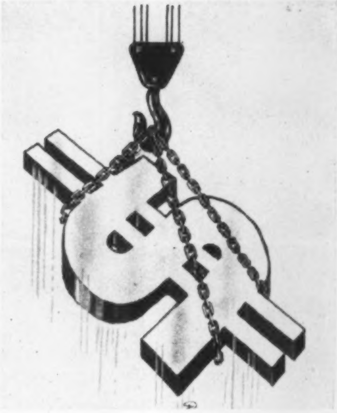
Model change-overs slow auto production.

Orders for machine tools total $87.4 million, a 41 per cent gain over July.

Government forecasts a $700-million budget surplus for fiscal year ending June 30, 1957.

This month's machine tool orders total $87.4 million, a gain of 41 per cent over July. Orders for the first eight months are 33 per cent ahead of those in same period of last year.

Construction expenditures for the month are the highest in history, $4.3 billion.



Steel prices rise

Both employment and factory workers' pay hit new highs. The average worker gets $79.79 for a week's work, while employment has climbed to 66,752,000.

September

PITTSBURGH Steamship Division of U.S. Steel signs three-year contract with two AFL-CIO maritime unions ending a strike which has kept the fleet from returning to work since the end of the steel walkout.

Acme Steel Co., Chicago, plans to build a $15 million plant in the Calumet harbor area. It will have a monthly capacity of 17,000 tons of semifinished billets and slabs.

Increases in steelmaking scrap push STEEL's composite to record $59.67 a ton.

George Meany, president of the AFL-CIO, states his organization seeks shorter hours for its members without any reduction in pay.

The E. W. Davis Works is dedicated by Reserve Mining Co. It's jointly owned by Armco and Republic Steel Corp. The $190-million taconite project has produced nearly 2 million tons of pellets in less than a full year of operation. Eventually, the plant will produce 3,750,000 tons of iron pellets annually.

Commerce department eases rules for licensing exports of iron and steel scrap.

Tin prices advance sharply in New York and London as result of seizure of Suez canal.

Ford Motor Co. says its 1957 models will cost an average of

HANSEN
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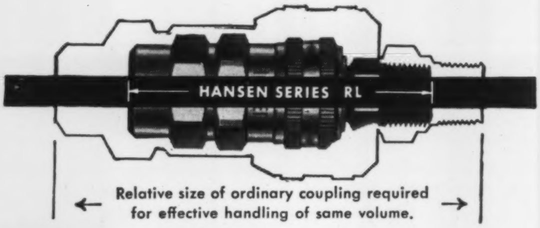
QUICK-CONNECTIVE
RING-LOCK COUPLINGS



Relative size of ordinary coupling required for effective handling of same volume.

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Consequently, by standardizing on either Hansen Series 2-RL or Series 3-RL Couplings, you eliminate any need for various size couplings in your hook-up—make it easy to keep stock of parts in balance—and hold inventories to a minimum.

Locking ring provides positive lock and assures tight fit. Equipped with automatic sleeve lock.

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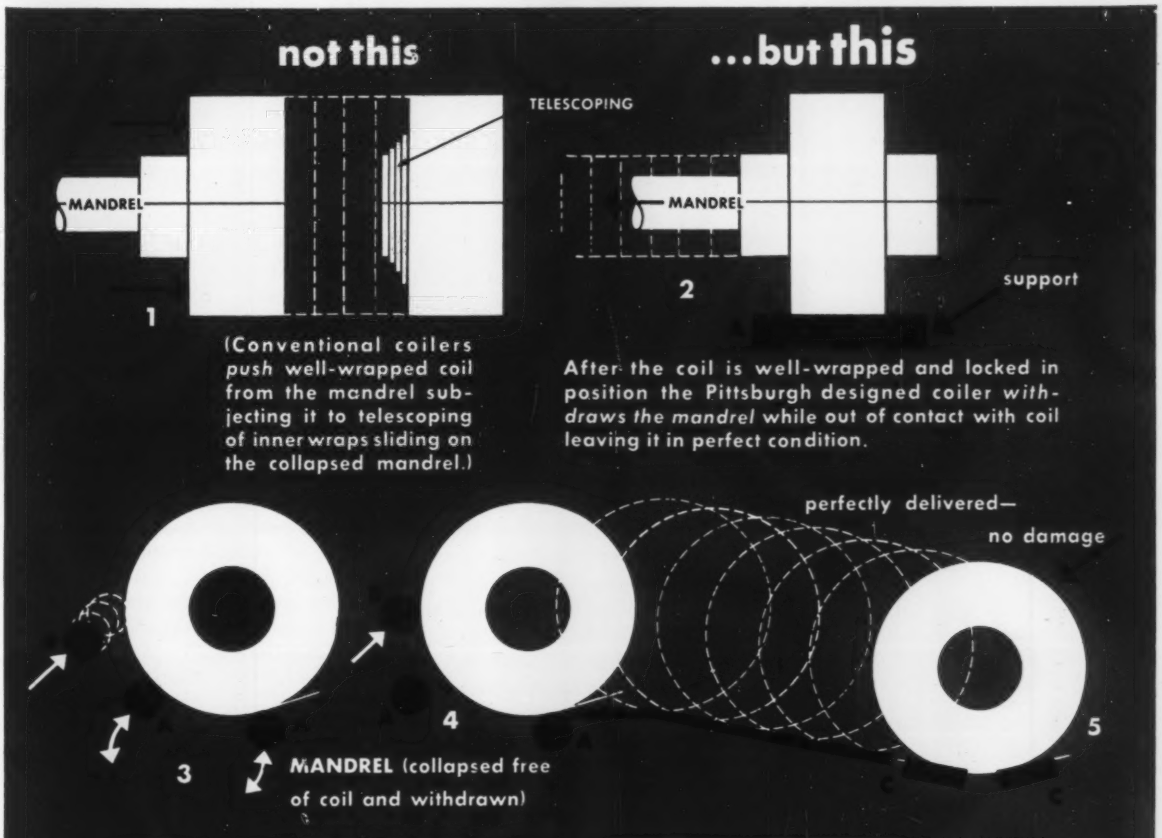
Delivers each coil in perfect condition


not this
...but this
TELESCOPING
MANDREL
MANDREL
1
2
support
perfectly delivered—
no damage
A
A
A
B
B
3
4
5
C
C
MANDREL (collapsed free of coil and withdrawn)

(Conventional coilers *push* well-wrapped coil from the mandrel subjecting it to telescoping of inner wraps sliding on the collapsed mandrel.)

After the coil is well-wrapped and locked in position the Pittsburgh designed coiler *withdraws the mandrel* while out of contact with coil leaving it in perfect condition.

Sketches 1 and 2 above illustrate how improved design of the new Pittsburgh Mandrel coiler eliminates coil-distortion in removing the coil from the mandrel. Sketches 3-5 show how the coil is then *speedily* moved from support rolls (A) by pusher roll (B) to the receiving cradle (C) for side delivery from the coiler. The coil is then ready for transfer in perfect condition.

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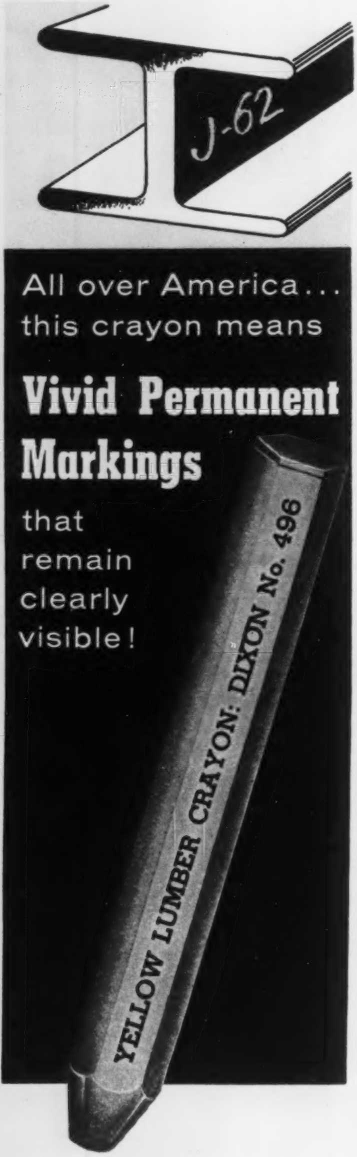
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Nasser seizes Suez canal

about 2.9 per cent more than 1956's.

Commerce department removes export restrictions on refined copper for the fourth quarter.

Increased tin plate prices and wage increases force a hike of 3.7 to 4 per cent in tin can prices.

Living costs climb to a high of 117.1 per cent of the 1947-49 average.

Factory sales of home laundry equipment hit all-time monthly high of 601,103 units. For the first nine months, sales are 8 per cent ahead of the 1955 pace. Biggest gain is in automatic clothes dryers.

Steel mills operate at 101.6 per cent of capacity to produce a record 2,502,000 tons of ingots in a week.

Marquette Iron Mining Co. makes its first shipment (4999 tons) of treated and pelletized iron ore from low grade jasper deposits in northern Michigan's Marquette range.

Wages and living costs push to new highs. Average hourly wages of factory workers hit $2. Average weekly pay of $81 also sets record. Living costs are 0.1 per cent higher than they were in July.

October

DEFENSE Mobilizer Arthur S. Flemming says rulings on applications for fast tax amortization of steel expansion projects will take several months. (Proposed expansions total $1.5 billion.) He explains that Defense department first must complete new estimates of steel needs for the armed services.

Steel industry sets another weekly production record in the one ended Oct. 14. By operating at 102 per cent of capacity, the industry produces 2,511,000 net tons of steel for ingots and castings.

Short term borrowing costs (3.02 per cent) of the government dramatize money squeeze. The rate is the highest since March, 1933.

American Motors Corp., Detroit, makes big change in the 1957 Rambler: For the first time, it puts V-8 engine in its volume car.

Decline in copper demand lowers price to 36 cents a pound.

Competition in the appliance industry forces Avco Mfg. Corp., New York, to drop its Crosley line. Bendix Division is sold to Philco Corp., Philadelphia.

Hungarians revolt; situation in Poland is touch and go; Israel decides it's time to do something about Arab raids. When Britain and France bomb Egypt, Israeli troops head for Suez canal.

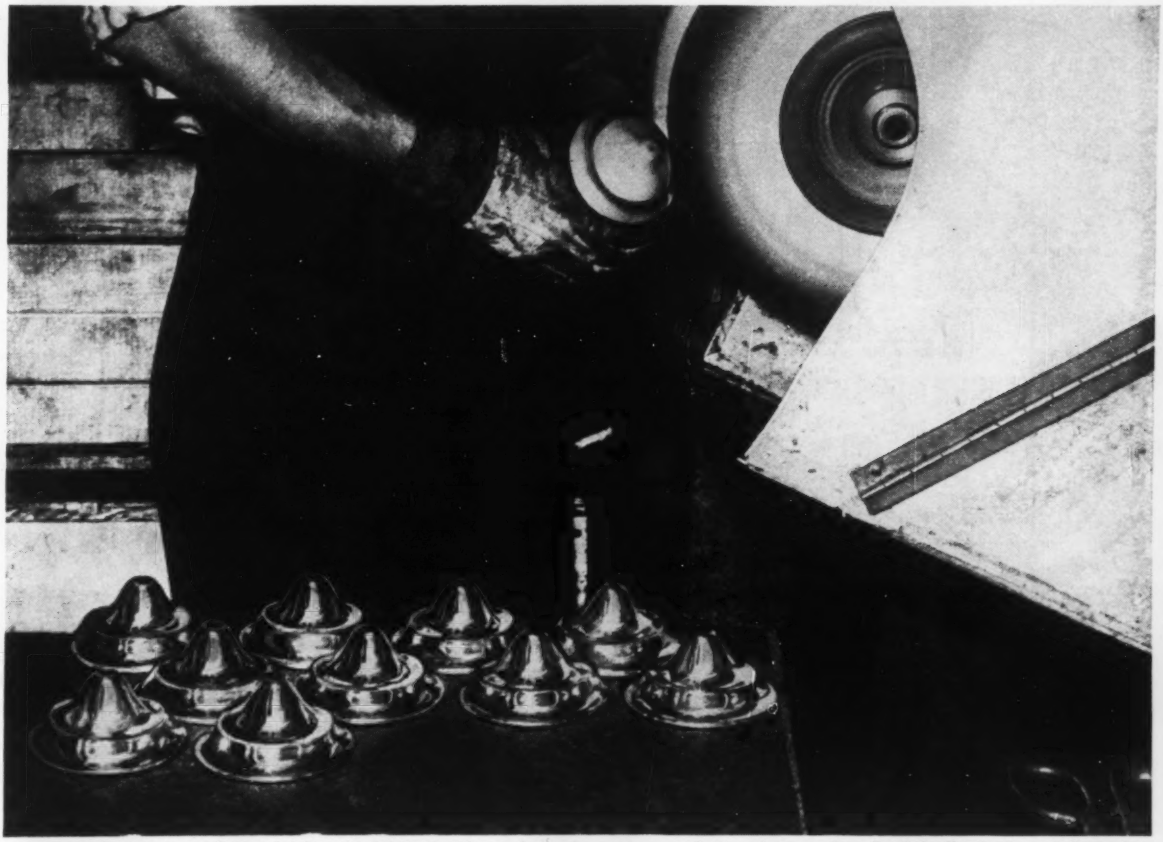
Manufacturers sell a record $30.1 billion of goods during month.

Production of mines and factories, says the Federal Reserve Board, is at record levels—150 per cent of the 1947-49 average. Rise in the cost of living continues—it is a record-breaking 117.7 per cent of the base period.

Industrial plant investment in metropolitan Chicago for the first ten months totals more than $500 million. Investment for the similar period of last year was less than $280 million.

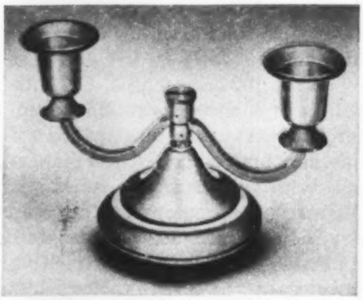
Marquette Iron Mining Co., operated by Cleveland-Cliffs Iron Co., Cleveland, makes the first ship-

Money supply becomes tighter



THE BASE of a Huntercraft Candelabra Model 8008 (shown below) requires, with Formbrite, only a finish buff. The base is formed in two drawing operations. The deeper drawn candle cups, also of Formbrite, need only a light cutting with Tripoli and a finish buff.

It's easy to get a jeweler's finish with Formbrite



HUNTERCRAFT Table or Wall Candelabra Model 8008, one of 30 fine brassware items in the line of Huntercraft Originals.

"Formbrite cut polishing cost and time dramatically—was a major factor in keeping our small business alive . . . and growing," says Ralph E. Hunter of Huntercraft.

THE production of Huntercraft Originals—now a nationally distributed line of fine brassware—has grown from a basement hobby to a thriving new business in less than 5 years.

The Hunter Machine Service Company of Racine, Wisc., began manufacturing Huntercraft Originals on a commercial scale in 1951, using ordinary soft forming brass. To get the gleaming jeweler's finish required, polishing time and costs were high. In fact, they were so high that the young company found it impossible to bring their prices into line with competition.

In 1953, they tried Formbrite®, Anaconda's superfine-grain drawing brass. The polishing bottleneck was broken and production soared – unit costs went way down. According to Ralph E. Hunter, owner and president of Hunter Machine Service Co., Formbrite was a major factor in keeping the company alive and enabling it to go on to become a stable, growing business. The finish obtained so easily on Formbrite, he adds, is superior to that achieved on ordinary drawing brass.

Formbrite is a premium product at a nonpremium price. Find out for yourself how its superfine-grain, excellent drawing properties, strength, and scratch-resistance can help you make a better product at lower cost. Write for Publication B-39. Better yet, ask for a sample or a trial batch. Address: The American Brass Co., Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 5672

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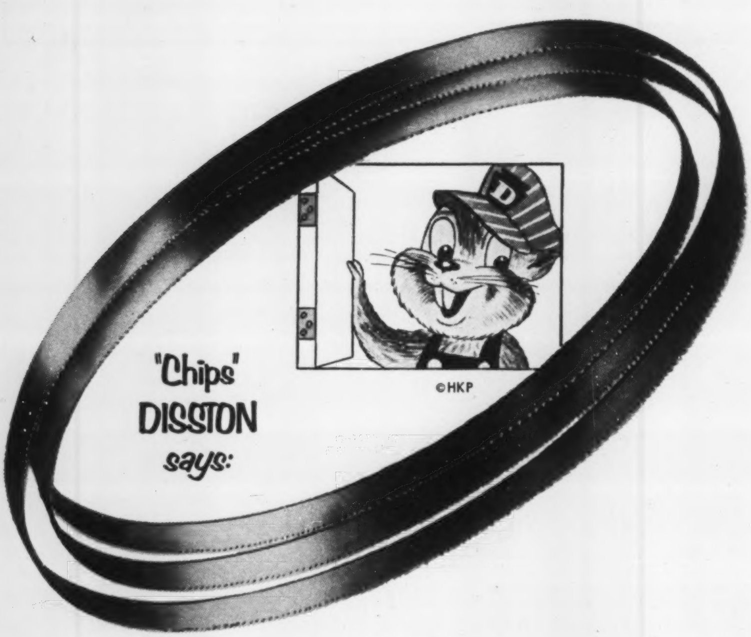
an ANACONDA® product

made by The American Brass Company



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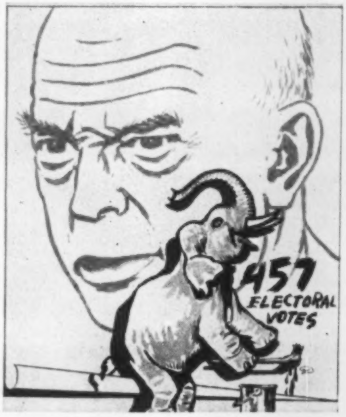
ment of treated and pellitized iron ore from low-grade jasper deposits.

November

RESULTS of Nov. 6 election stack up like this: Ike first, the Democratic donkey second, the Republican elephant a close third, Adlai a poor fourth. Voters put their stamp of approval on $2.3 billion of state and local bond issues.



Ike wins again

The aluminum stockpile reaches its minimum goal.

Brisk cleanup by auto dealers leaves them with less than 150,000 1956 cars on hand. Detroit starts working overtime on '57 models.

Ford Motor Co. christens the newest member of its family the Edsel—its introduction is scheduled for the fall of 1957. The car will have its own engine. One line will have some body stampings interchangeable with Fords; those of another line will be interchangeable with some Mercury panels.

STEEL's price composite for scrap climbs to record $62 a gross ton. At Pittsburgh, No. 1 heavy melting scrap goes up $9 a ton. Price hits record $67.

Bethlehem plans a four-for-one split of its common stock.

December

FEDERAL Housing Administration boosts the interest rate on loans to 5 per cent in an effort to increase the amount of money available for home construction.

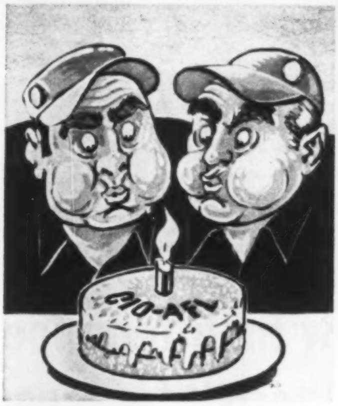
Great Britain and France decide to get out of Egypt. They leave behind the problem of how long it will take to clear the canal and who will pay for the job. The blocked channel brings gasoline rationing to western Europe. Shortage of steel plates promises to be intensified by need for oil tanker construction.

Steel production is at 102 per cent of capacity, sets a weekly production record of 2,511,000 tons.

Bethlehem Steel Corp. and Youngstown Sheet & Tube Co. step toward merger after hesitating since 1954. Justice department opposes the move, says it would tend to create a monopoly.

Continuing rise in scrap prices brings Steel's index to a record $66.17 a ton. For the first time since early 1948, scrap is selling above basic pig iron for which the composite is $62.18.

The United Auto Workers look far ahead. Locals at GM, Ford and Chrysler have endorsed a demand for a shorter work week (with the same amount or more money) when contracts expire in 1958.



AFL-CIO celebrates first birthday

U.S. Steel's Pittsburgh Steamship fleet continues ore shipments as other boats head for winter berths. But bad weather stymies plans to operate until January. The last four boats to leave break a 57-year fleet record for late operation. Total ore shipments for the season are 9.8 million tons behind 1955 total.

Sen. Harry F. Byrd (Dem., Va.) sees little hope for a tax cut in 1957 unless foreign aid and domestic spending are cut sharply. He predicts the defense budget may have to be increased.

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TIPS ON TRUCKS

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Electric trucks . . . or gas trucks? Which should you choose? Which should you use?

Where a choice of gas or electric trucks exists, it is wise to choose the electrically powered type. Facts show that except under the most abnormal conditions of outdoor operation, and where the trucks will be subjected to excessive abuse, your electric trucks will outperform the gas trucks practically every time.

Wherever records have been kept, it is interesting to observe that electric trucks, on the average, are available for duty longer. Downtime with electrics is held to a bare minimum. According to the logs, downtime and maintenance costs for gas trucks run two, three, even four times that of electrics.

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An electric truck is built to deliver more value per dollar—right from initial purchase, through every day of its long worklife. But to get the most out of the modern electric truck, it takes a modern "power plant" as well.

For best all-'round performance, it pays to match the better truck with the better storage battery—C & D. Here's an advanced-type storage battery built by the company which pioneered the modern storage battery. C & D *Slyver-Clad*® batteries virtually eliminate 'shedding' as a determining factor in battery life . . . are designed to give a minimum 10 percent greater capacity in standard size trays.

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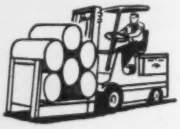
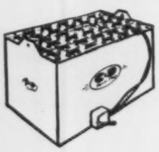
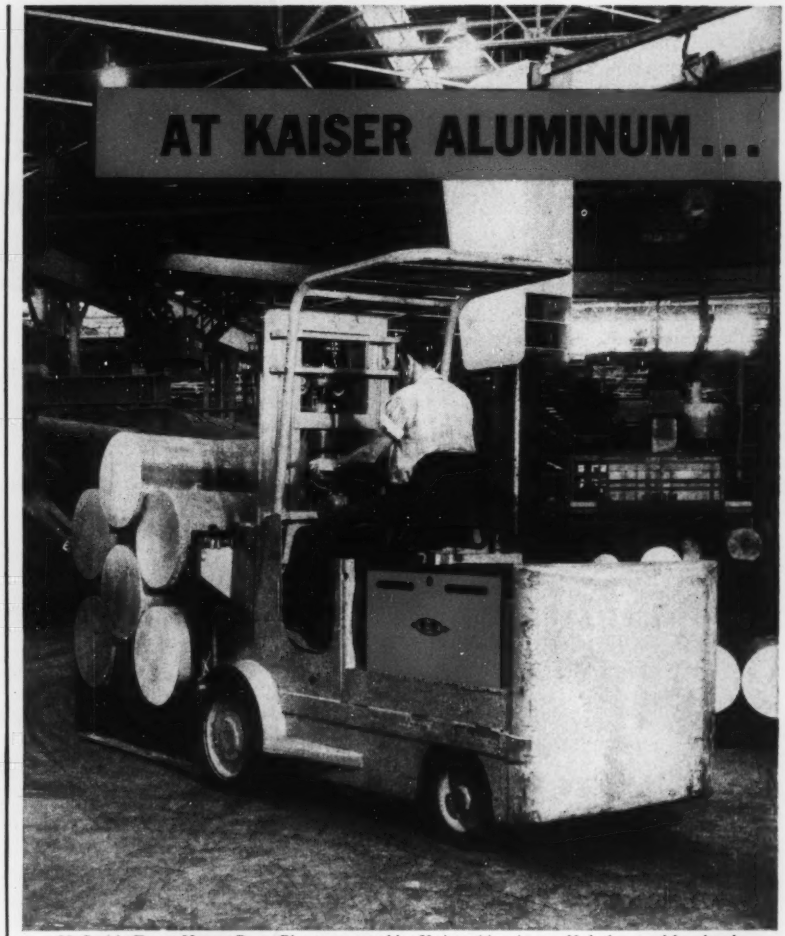
match the best in trucks — electric





. . . with the best in batteries—C & D.



U. S. Air Force Heavy Press Plant operated by Kaiser Aluminum, Halethorpe, Maryland.

Log many miles, low maintenance, lugging aluminum "logs" to press

Trucks all electric . . . batteries by C & D

Modern is the word for Kaiser Aluminum's operation of the impressive new Air Force Heavy Press Plant here in Halethorpe, Maryland. Modern right down to materials handling!

It's a continuous haul, back and forth, from billet casting to the huge extrusion presses. The fleet delivers tons of aluminum every day. But power-packed C & D *Slyver-Clad*® batteries — the advanced-design truck batteries that give you a minimum 10% *extra* capacity in standard-size trays—provide power to spare during the full 8-hour shift.

It's true! Trucks work longer . . . stronger . . . with C & D batteries aboard!

Why C&D? Write for— New Bulletin IT-524/56. Tells you how to get more work—through more battery—from all your electric trucks. Shows you why advanced C & D principles and construction keep handling costs down.

C&D

BATTERIES, INC.

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Sales and service offices in principal cities from coast to coast

Gap Press Line Has Capacities from 100 to 300 Tons

These presses are designed for the shallow drawing, forming and blanking operations of the automotive industry but are applicable to other industries such as appliance manufacturing.

The presses have bed areas large enough to accommodate the blanks that are formed into autobody grille and bumper guards. The 250-ton press illustrated has a 36 x 90 in. bed.

Single and double crank presses are available, depending upon width requirements of the blanks.

Strength, rigidity and low deflection are assured by the rugged welded-steel construction of the frame and slides.

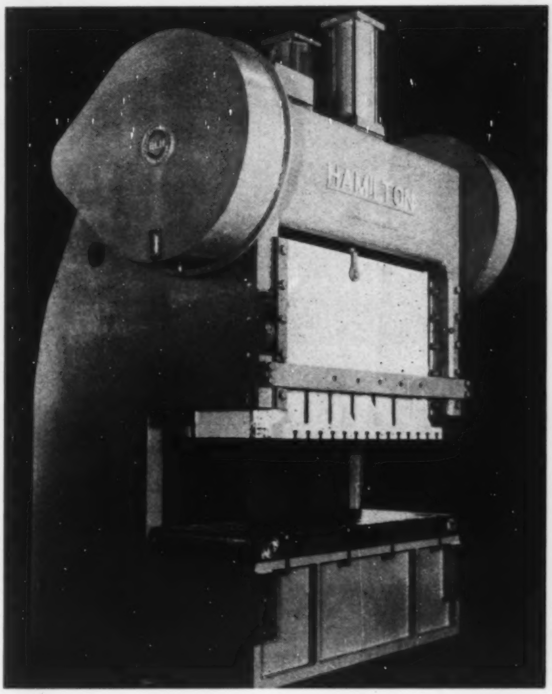
Both main and intermediate gears run in oil.

The presses have a pneumatically operated flywheel brake, a pneumatic clutch with an electric control system and a pneumatic counterbalance.

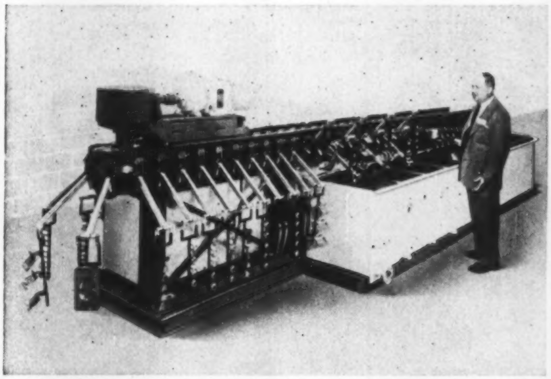
Barrel type screws, which remain vertical at all positions of the stroke, provide motorized slide adjustment.

Brake and clutch are interlocked mechanically to provide optimum performance and safety.

The clutch operates coolly; this permits single tripping at strokes per minute close to the continuous operating speed. *Write*: Hamilton Press Division, Baldwin-Lima-Hamilton Corp., Hamilton, O. *Phone*: Twinbrook 4-6511



Production Unit Designed To Plate Small Parts

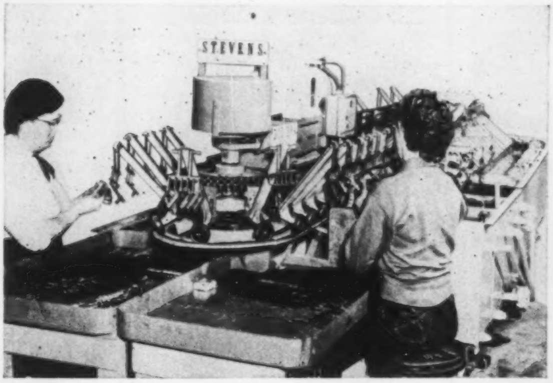


This machine is for plating electrical parts, door hardware, plumbing fixtures, pistons, small appliances and many other items. It also can finish larger parts that do not require extremely high production.

The unit does Alodine processing of aluminum, dichromate processing, tin immersion, and silver, copper, zinc, nickel, brass and chrome plating.

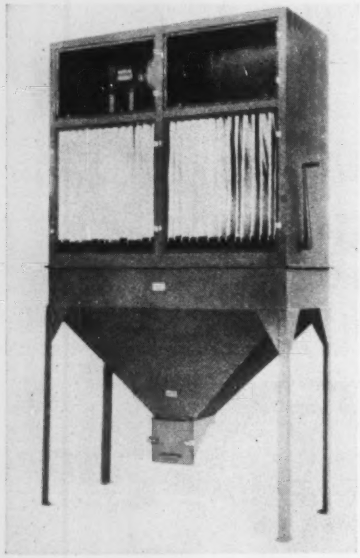
There are three ways to handle small parts with the machine: 1. The carrier arm acts as a holder for small racks. 2. The carrier arm acts as a rack and small parts are attached directly to it. 3. The carrier arm acts as a rack and the arms are racked on and off the carrier arm bracket of the machine.

The machine is 7 ft wide and 10 ft or more in length. *Write*: Frederic B. Stevens Inc., 1800 18th St., Detroit 16, Mich. *Phone*: Tashmoo 5-0725



Dust Collector

Model 123 handles continuous grinding and other high volume dust sources (as many as eight grinding wheels at a time). The filter area is 300 sq ft; dust storage capacity is 10 cu ft.

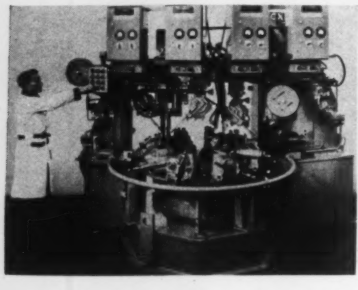


The 5-hp motor moves about 2000 cu ft of air a minute through an 8-in. inlet at speeds of more than a mile a minute. The motor is internally mounted in the clean air stream above the filters. *Write*: Department KP, Torit Mfg. Co., 287 Walnut St., St. Paul 2, Minn. *Phone*: Capitol 2-4419

Indexing Arc Welder

This automated eight-station machine has a two-station clamping fixture at each table station.

One fixture stage accurately positions and clamps a two-piece part while it is tack welded. The second stage fixture clamps and rotates the tack welded assembly while continuous contour welds are made on both sides of the part.



The model illustrated uses the CO_2 shielded arc method to weld a plate and bushing. It produces 320 automotive anchor plate assemblies an hour at 80 per cent efficiency.

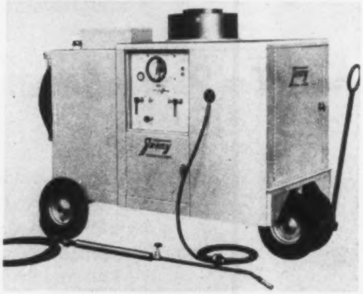
By changing clamping fixtures, the machine can be adapted to a variety of two-piece parts which require accurate positioning and joining with continuous contour welds.

The basic machine is adaptable to argon shielded arc welding. Current is supplied by four 600-amp rectifiers. *Write*: Expert Welding Machine Co., 17144 Mt. Elliott Ave., Detroit 12, Mich. *Phone*: Twinbrook 1-4327

High Pressure Cleaner

The Series 4000 Hypressure Jenny provides cleaning actions ranging from 400 gallons of clear cold water an hour at 450 lb of pressure to a mixture of steam, water and cleaning compound at 325°F.

The machine will blast heavy mud and clay deposits from trucks, road building or construction machinery; remove grease and dirt from equipment, machinery, parts and floors; clean for repainting; and do a thorough job of sanitizing or deodorizing.

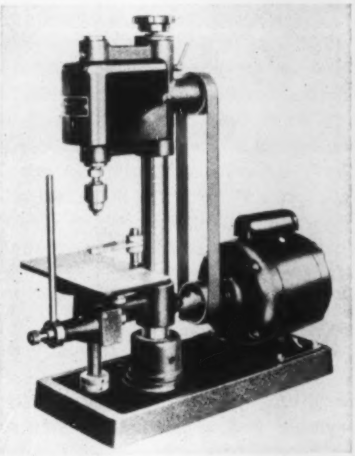


Portable or stationary models with pumps driven by an electric motor or gasoline engine are available. *Write*: Homestead Valve Mfg. Co., Coraopolis, Pa. *Phone*: Amherst 4-3240

Tapping Machine

Threaded holes as small and fine as 0.034 in. x 120 and as large and coarse as 0.25 in. x 24 can be tapped by this machine.

A honing device returns the machine's spindle to neutral instantly and automatically when pressure on the feed lever is released. This stops rotation of the tap and permits gentle withdrawal through reverse pressure on the feed lever. Thin sheets can be precision tapped without risk of stripping.

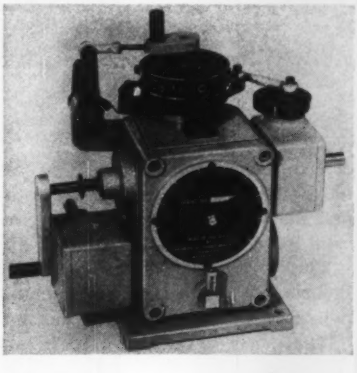


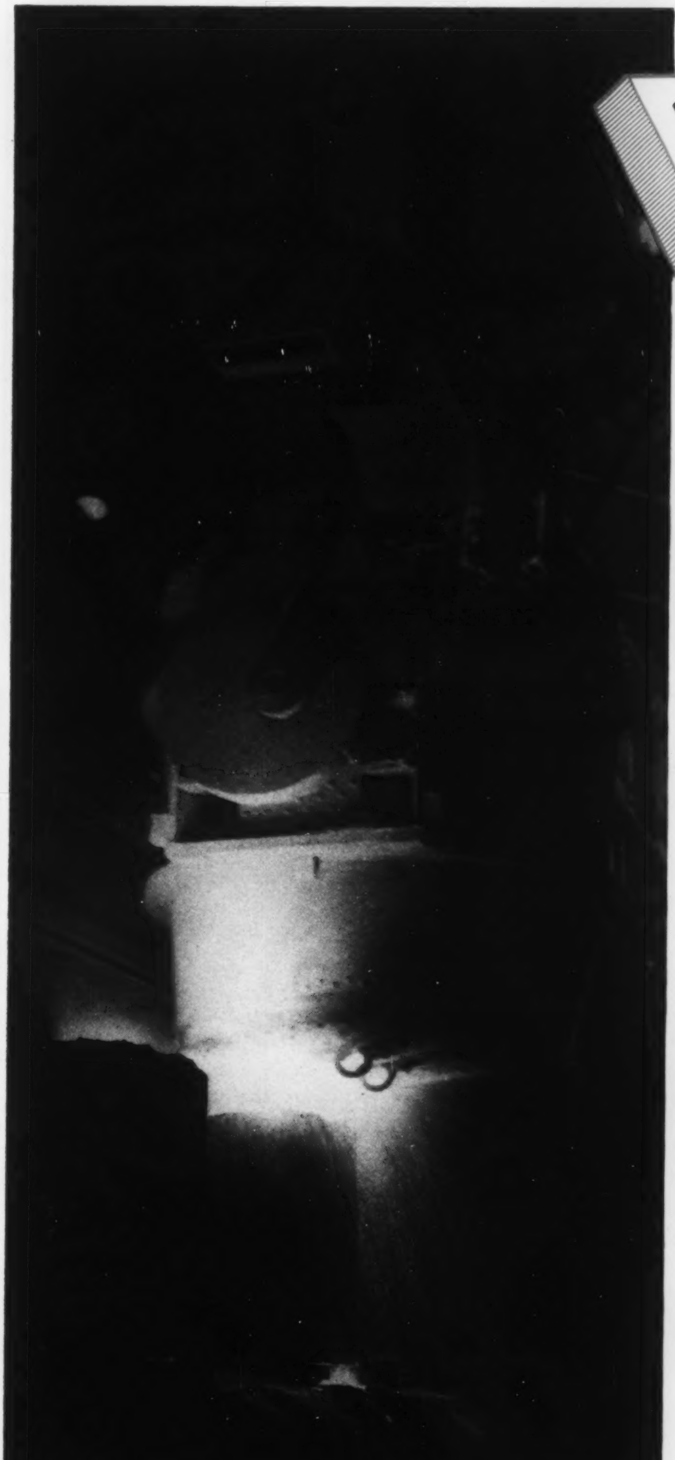
Maintenance of the neutral position of the spindle prevents any rotation of the tap before feeding pressure is applied. This makes the entrance of the tap into the work slow and gentle; brittle materials are protected from damage due to impact. *Write*: Hamilton Tool Co., 848 S. Ninth St., Hamilton, O. *Phone*: Twinbrook 4-8358

Variable Transmission

Settings can be adjusted manually or automatically while the unit is standing still or in motion.

The multiple contact of driving and driven discs, which are free floating on splined shafts, transmits the power. Transmission components run in oil and are completely enclosed. Control is arranged by electrical, mechanical,





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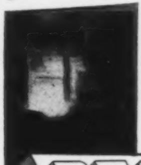

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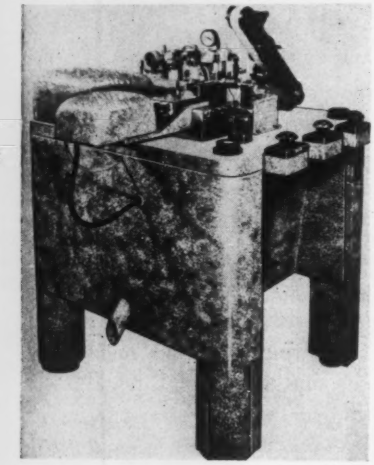
hydraulic or pneumatic means.

Optional spur, bevel or worm gear reductions are available and may be installed in any of four positions or planes. Only two sizes of socket wrenches are needed for disassembly and reassembly. *Write*: George E. Clentimack Co. Inc., 229 West St., North Attleboro, Mass.

Commutator Turning

Model CTM 2000 uses diamond cutting tools which enable semi-skilled operators to turn 500 to 700 commutators an hour.

Rough and finish turning can be done simultaneously by using two diamond tools.

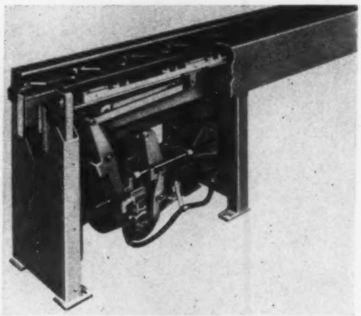


The automatic machine can be quickly adjusted to turn commutators up to 2 in. in diameter and 2 in. long with a tolerance of 0.0003 in. or better. A 15 microinch surface finish can be provided. A complete armature change can be made in about 15 minutes.

Two lubricating systems automatically supply oil to all vital working parts, including the armature shaft journals during the copper removing process. *Write*: Motor-Mation Inc., 116 W. Ninth St., North Canton, O.

Transfer Table

Parts are transferred from station to station for automatic or manual operations by the in-line table. It can be adapted to multiple, consecutive operation and will handle 6400 pieces an hour.



The table is for parts which have a flat surface so they can slide along a track from station to station. Parts are cam locked, within 0.005-in. tolerance, at each station without auxiliary locating devices.

Index distance can be varied from 3 to 9 in., time from 0.25 to 0.7 second. *Write*: Dixon Automatic Tool Inc., 2300 23rd Ave., Rockford, Ill. *Phone*: 5-8756

Lapping Machine

A dual agitator tank on the Model 24 Lapmaster permits both coarse and fine lapping. Coarse abrasive is used in one tank, fine abrasive in the other.

If lapping tolerances are not critical, it is not necessary to change laps and conditioning rings when switching from one tank to the other. Cleaning of the lap plate is all that is required.

Roughing to finishing and back to roughing can be maintained as a continuous cycle. This boosts production, saves time and permits a reduction in equipment investment.

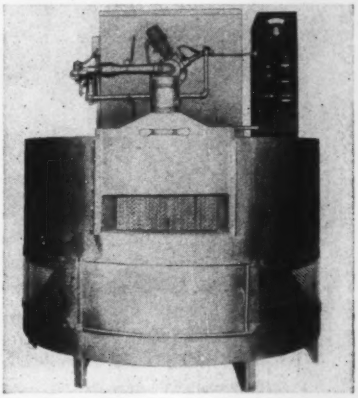
Where fine lapping is required, a second lap and set of conditioning rings are needed. These are changed as the lapping operation is switched from one tank to another.

Surface flatness can be generated to less than one light band, finish to 2 rms. *Write*: Department SLC, Crane Packing Co., 6400 Oakton St., Morton Grove, Ill. *Phone*: Orchard 3-6800

Rotary Hearth Oven

One worker can load and unload this oven from the same position as work moves in and out of the heating zone continuously.

Standard speed range is 2 to 10 ipm (about one to five revolutions an hour).



An alloy steel chain curtain is used to conserve heat and provide convenient access to the work chamber.

A 125,000-Btu burner supplies heat for the well-insulated working chamber. *Write*: Grieve-Hendry Co. Inc., 1401 W. Carroll Ave., Chicago 7, Ill. *Phone*: Taylor 9-0200

Arc Control

A greater range of current density with a given electrode is provided by the arc characteristic control of this line of constant voltage welders.

A tapped phase-shifting device controls the arc characteristics. On the 300-amp model, a five-position rotary switch is provided on the front panel for the arc control. The first position by-passes the control, and the welder operates as a standard constant voltage unit. Succeeding positions provide for arc stabilization at decreasing current

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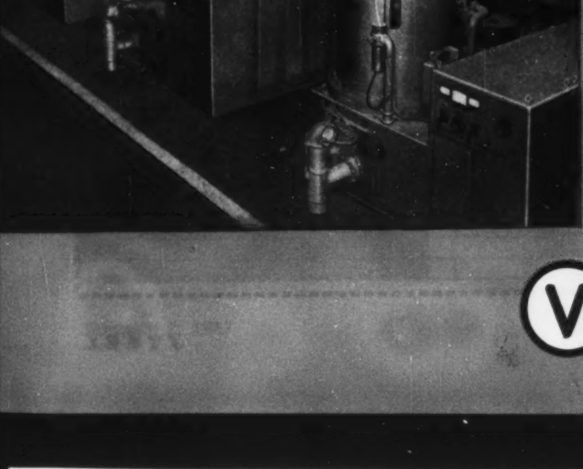

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"Quick on the Draw" has a new meaning with the pre-wired, packaged MOTOBLOX: higher top speeds in regular operation! Add to this the advantages of new stability, new flexibility, new low installation costs, new accessibility of electrical equipment—and you get *payoff performance that pays looking into. Write us.*

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Twin Screw Knee Support

Think it over . . . twin screw knee support is the one really new basic advancement in knee type milling machine design in years. And only Kearney & Trecker new TF Series machines have it!

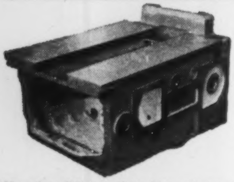
Here's why it makes sense.

Because the *twin screw* design distributes most effectively the weight of much larger, heavier knees, saddles and tables, it fulfills today's requirements for higher speeds, feeds and power — greater machine capacity. What's more, this *balanced design* substantially increases stability under heaviest loads . . . offers greater resistance to torsional thrust under all cuts . . . divides the wear factor in half, thus assuring greater, longer-lasting accuracy.

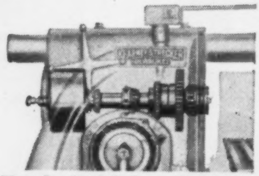
Kearney & Trecker's feature-packed TF Series line of general production machines is available in five sizes — No. 2 to No. 6, from 10hp to 50hp in Plain, Universal and Vertical styles.

Why take less than the latest when you want new milling machines? You can get all the facts on the new TF's from your Kearney & Trecker representative, or write direct to Kearney & Trecker Corp. Mail coupon for new catalog with details on TF Series machines.

5 more reasons why TF Series milling machines are way out front in rigidity

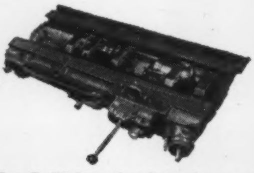


Heavier, Wider, One-Piece Knee—The TWIN SCREW arrangement supports the heavier, larger knee. Span and length of ways is increased considerably, providing fuller saddle support . . . lasting accuracy . . . substantial reduction of way and gib wear.



Three-Bearing Spindle — Complete assembly consists of three heavy-duty bearings, flywheel, a train of wide-faced forged steel gears. Rigidity of spindle unit contributes to increased cutter life, better finish and quieter operation.

Double "Vibra-Void" Overarms — Two solid steel bars, mounted completely through column, void vibration at source, afford more rigidity and resistance to deflection than any other type support. Design also greatly simplifies changing of arbors and cutters.



"Fron-Trol" Operating Convenience—Front-mounted controls include feed selection, Mono-Lever table feed and rapid traverse, automatic cycle table feed and rapid traverse controls, table handwheel, saddle clamping gib and backlash eliminator. Machines have 2" dia. table feed screw.

Massive Column—Solid back, double-box section column is scientifically ribbed throughout to rigidly withstand heaviest cutting forces. Full bearing column face affords maximum support for the knee. Cross-mounted motor assures maximum ventilation, easy access for routine maintenance.

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loads, which permits the operator to select the characteristics best suited to the job.

Operation of large models is similar, except that the setting for the desired operating characteristics is obtained by changing jumpers on a panel inside the housing. *Write*: Metal & Thermit Corp., 100 Park Ave., New York 17, N. Y. *Phone*: Lexington 2-6300

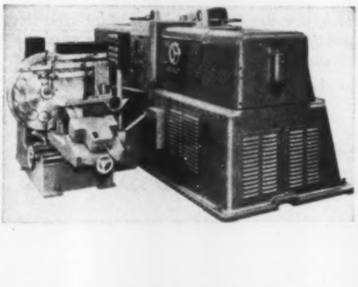
Brighteners

ARP 52 is a zinc barrel brightener additive (a powder) that provides a lustrous deposit at low rates of consumption.

ARP 41 is a liquid cadmium plate brightener. It operates over a wide range of current densities and rinses free of water breaks. *Write*: Allied Research Products Inc., 4004-06 E. Monument St., Baltimore 5, Md. *Phone*: Peabody 2-9070

Grinding Machine

The No. 240-30 in. Double Horizontal Disc Grinder finishes piston rings, bearing rings, automatic transmission plates and similar shapes.



All spindle motors are contained within the base. Pushbutton controls are on both sides. *Write*: Besly-Welles Corp., South Beloit, Ill.

Seam Welder

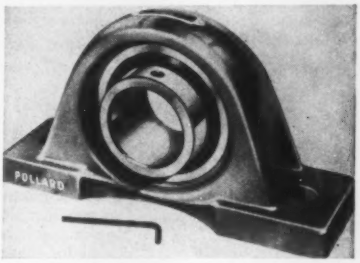
Longitudinal seams on cylinders and flat sheets can be welded by this machine. Work from 3 to 30 in. in diameter can be handled.

The welder operates manually or automatically. There are three sizes available in floor and bench models. Lengths are 18, 24 and 30 in. *Write*: Reed Equipment Division, Webb Corp., Webb City, Mo. *Phone*: 29

Pillow Blocks

The Pollard Self-Lube line of pillow blocks, flange units and take-ups comes in normal and medium duty series in sizes of ½ to 4 in.

All bearings are sealed for life; the need for continuous lubrication is eliminated.



All units are self-aligning, as well as self-sealing. Housings and bearings are interchangeable with most standard makes. *Write*: Rockwood Pulley Mfg. Co. Inc., 20 Crosby St., New York 13, N. Y. *Phone*: Canal 6-7764

High Speed Drills

These 18 per cent tungsten tools are heat treated twice to make them hard without imparting brittleness.

Each drill has maximum land relief, so it is less likely to bind and break. Flutes are ground and polished to a fine microfinish. *Write*: Air Transport Equipment Inc., N. Albany Ave., Amityville, N. Y. *Phone*: Amityville 4-5300

NEW Literature

Write directly to the company for a copy

Carbide Tools

This 100-page catalog presents engineering data and information on the use and care of a line of solid carbide tools. Atrax Co., Newington, Conn.

Fluid Drives

Adjustable speed drives in the 7½ to 800 hp range are described in bulletin A-119, 8 pages. American Blower Corp., Detroit 32, Mich.

Thermocouples

Bare wire thermocouple glands are described in a folder. Conax Corp., 7811 Sheridan Dr., Buffalo 21, N. Y.

Heat Treating

Basic furnace mechanisms for automating heat treating lines are shown in bulletin SC-176, 8 pages. Surface Combustion Corp., Toledo 1, O.

Stainless Fasteners

This 8-page bulletin charts the sizes of 37 fastening devices. Allmetal Screw Products Co. Inc., 821 Stewart Ave., Garden City, Long Island, N. Y.

Pallet Unloader

A machine that receives pallet loads of cases and unloads them automatically is described in bulletin F-225, 4 pages. Alvey Conveyor Mfg. Co., 9301 Olive Street Rd., St. Louis 24, Mo.

Gray Iron Castings

This 8-page bulletin tells what information should be supplied with an order for castings or a request for a quotation. Gray Iron Founders' Society Inc., 930 National City-E. Sixth Bldg., Cleveland, O.

Plastics

This 16-page bulletin covers characteristics, fabrication techniques and uses of polyethylenes, vinyls, phenolics, styrenes, epoxies and polyesters. Bakelite Co., division of Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

Metal Shapes

Bulletin P3, 24 pages, lists sizes and gages of 24 die formed metal shapes. Commercial Shearing & Stamping Co., 1775 Logan Ave., Youngstown 1, O.

Spring Calculator

The weight of springs made from round wire or flat stock can be determined with this circular slide rule. National-Standard Co., Niles, Mich.

Roof Ventilators

Bulletin 2300, 4 pages, describes low silhouette ventilators with capacities of 287 to 938 cfm. Ilg Electric Ventilating Co., 2850 N. Pulaski Rd., Chicago 41, Ill.

Steel Buildings

Truss-type buildings that provide clear-span widths up to 100 ft are described in bulletin SX-14156, 6 pages. Product Information Service, Armco Drainage & Metal Products Inc., Middletown, O.

Automatic Stitcher

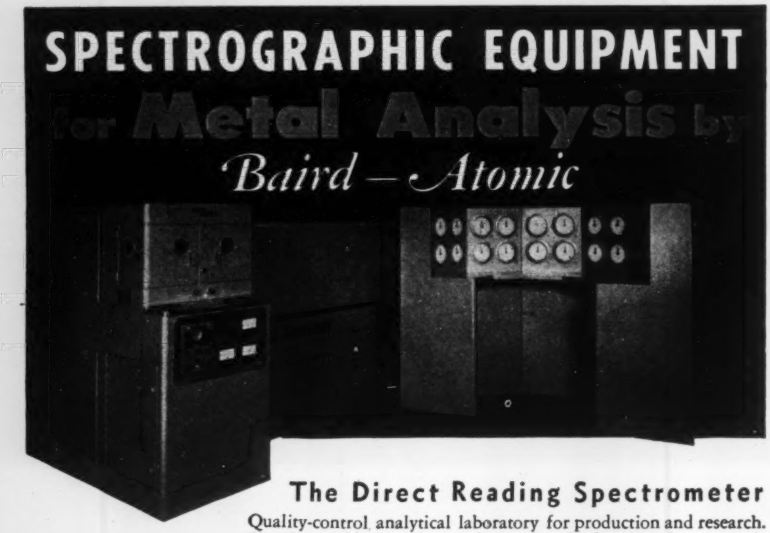
Bulletin 563, 4 pages, describes an automatic stitcher and shear for continuous processing lines. Herr Equipment Corp., 1200 Vine St. N. E., Warren, O.

Die Sets

Catalog 11, 76 pages, describes die sets and accessories. Producto Machine Co., Bridgeport, Conn.

Centralized Lubrication

Bulletin 4C, 24 pages, depicts automatic and semiautomatic lubrication systems for small machines. Bulletin 4D, 4 pages, describes circular window units that may be used to observe



The Direct Reading Spectrometer

Quality-control analytical laboratory for production and research. Simple, rapid operation — forty seconds for complete analysis on dials reading directly in percent concentration. Permanent optical alignment with the Automatic Servo Monitor. Other features include: unique (patented) measuring system . . . plug-in components assuring continuous operation . . . rugged design for plant operation . . . and versatile specimen holders.

Spectromet Designed for production-floor operation by non-technical personnel. Sealed housing provides complete environmental protection of optical and electronic systems. Spectromet provides rapid direct-reading results, extremely simple operation. No critical adjustments. Automatic Servo Monitor for permanent optical alignment. Analysis of eight elements in 40 seconds.

Complete Spectrographic Laboratory

Baird - Atomic, a pioneer in the emission spectrographic instrument industry, offers a complete line of equipment for a spectrographic laboratory. Over twenty years of experience and design are incorporated into the following components: Three-Meter Grating Spectrograph, with its 20-inch camera; Double Beam Densitometer Comparator, employing an optical null-balance system and allowing for direct density measurements on a linear scale; Calculating Board, to easily translate densitometer readings into percent concentration values; and Spectrographic Source Unit, whose versatility supplies a full choice of excitation conditions for all emission problems.

Baird-Atomic offers a complete line of spectrographic equipment for the analysis of metals in production and fabrication.

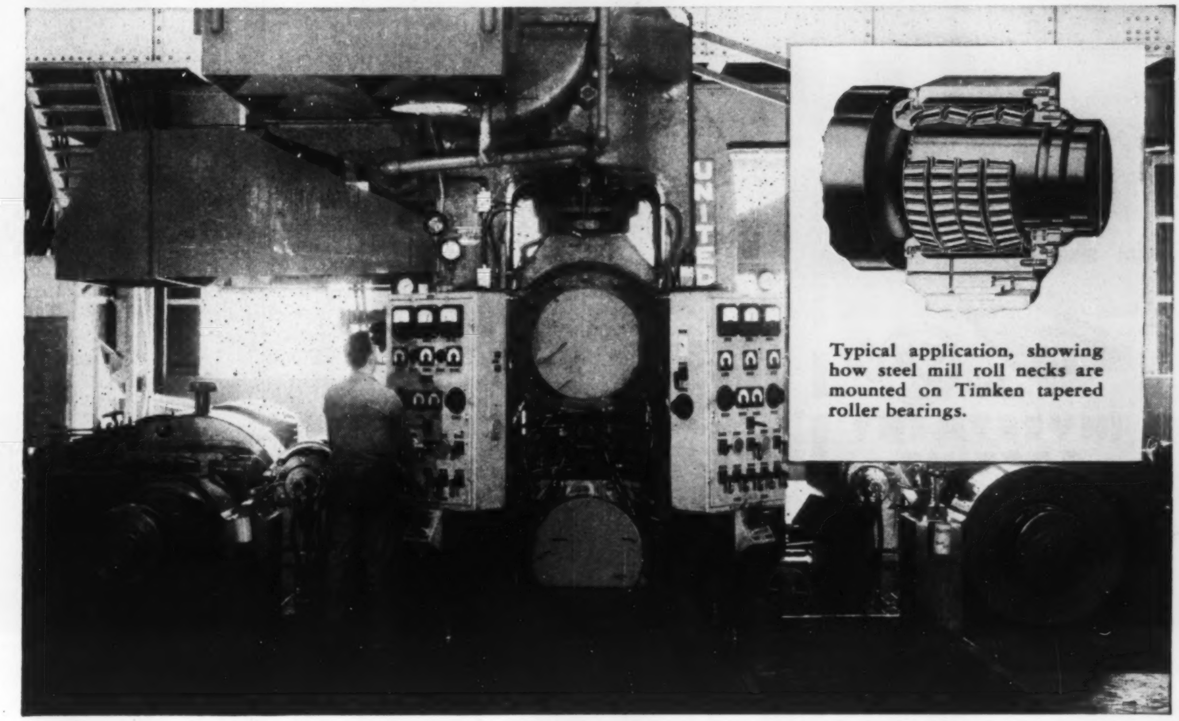
B-A instruments provide rapid, accurate analysis . . . simple, stable operation, trouble-free economical performance.

Complete Technical Information Available Upon Request.

BAIRD BI ATOMIC

Baird—Atomic, Inc.
33 UNIVERSITY ROAD, CAMBRIDGE 38, MASSACHUSETTS

Scrap loss minimized with reversing cold mill back-up rolls on TIMKEN® bearings



Typical application, showing how steel mill roll necks are mounted on Timken tapered roller bearings.

THE back-up rolls on this United Engineering 6″ & 34″ x 30″ 4-high reversing cold mill at Allegheny Ludlum's Leechburg plant are mounted on Timken® tapered roller bearings. Timken bearings give low torsional resistance, regardless of operating speed or load. This eliminates the need for altering or relieving screw-down pressure — maintains gauge which minimizes scrap loss at each end of the coil. Less hydraulic accumulator pressure is needed with rolls driving easier on Timken bearings, which reduces bearing wear, cuts maintenance cost.

The balanced proportion design of Timken bearings provides maximum capacity in a given space. Timken tapered roller bearings give you greater mill rigidity, permit large diameter roll necks. They take both radial and thrust loads in any combination, require *no extra thrust devices*—which means more compact chuck mountings, simplified mill design. And by holding mill rolls rigid, Timken bearings help insure "on-gauge" operation, cutting scrap loss and reducing still further the cost per ton of steel rolled.

With Timken bearings, roll and chuck are held concentric, making closures more effective. There's less leakage of lubricant. And with economically grease-lubricated Timken bearings, lubrication requires no tubes, pipes or reservoirs. When you build or buy machinery, look for the trademark "Timken". The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

TIMKEN TAPERED ROLLER BEARINGS ROLL THE LOAD

TRADE-MARK REG. U. S. PAT. OFF.

FORGING, COINING and MILLING *Eliminated!*

This EpCo **INVESTMENT CASTING Proves the Point**

PART: Paper Gripper for Printing Press

MATERIAL: Alloy Steel 4340

PROBLEM: To lower costs substantially below those of difficult and expensive forming methods yet retain the following features:

1. Sharp reverse knurling for more efficient gripper action.
2. Maintain uniform gripping action from part to part.
3. Eliminate milling and coining operations.

SOLUTION: An EPCO Investment Casting - - It produced a sharp gripping pad in true relationship to the center line of part.

CONCLUSION: When the shape of a part makes it difficult or expensive to perform special forming operations check an EPCO Investment Casting as a possible solution.

Send us drawings, samples and specification of parts for detailed process analysis and cost quotation without cost or obligation.

ENGINEERED PRECISION CASTING CO.
Box ST-68
Matawan, N. J.

MEMBER INVESTMENT CASTING INSTITUTE

internal conditions, indicate flow or show liquid level. Service, Bijur Lubrication Corp., 151 W. Passaic St., Rochelle Park, N. J.

Furnace Control

A system for the control of furnace pressures is described in bulletin 11.4-1, 2 pages. Industrial Division, Minneapolis-Honeywell Regulator Co., Wayne & Windrim Ave., Philadelphia 44, Pa.

X-Ray Microscope

Theory of operation, technical details and uses of an x-ray microscope are covered in a catalog. X-Ray Department, General Electric Co., Milwaukee 1, Wis.

Magnet Wire

Properties of an enameled magnet wire that resists Freon 12 and 22 are given in a 4-page bulletin. Electric Auto-Lite Co., Port Huron, Mich.

Flexible Couplings

Bulletin C 41-56, 24 pages, describes couplings which are torsionally flexible, and isolate vibration, cushion shock, compensate for misalignment and need no lubrication. Industrial Sales Division, Morse Chain Co., Ithaca, N. Y.

Wire and Cable

This 40-page catalog presents data on rubber insulated Neoprene sheathed nonmetallic cables. National Electric Products Corp., Gateway Center, Pittsburgh 22, Pa.

Stamping Lubricants

Bulletin 138, 4 pages, describes lubricants for stamping and deep drawing. Department S, Lubricants Division, Magnus Chemical Co. Inc., Garwood, N. J.

Strapping Machine

Uses and specifications of a pneumatically powered and electrically controlled strapping machine are described in this 4-page bulletin. Acme Steel Products Division, Acme Steel Co., 135th & Perry Ave., Chicago 27, Ill.

Coal Handling

Bulletin 551-D tells how to control dust from coal and coke handling operations. Wheelabrator Corp., 1157 S. Byrkit St., Mishawaka, Ind.

Silicones

This 12-page bulletin describes about 150 silicone products and compares them with the materials they are displacing. Dow Corning Corp., Midland, Mich.

Gas Burner

Specifications of sealed, nozzle-mixing burners for radiant tubes are given in catalog H-46. Eclipse Fuel Engineering Co., Rockford, Ill.

Shell Molding

This 32-page bulletin describes the machines and methods used in shell molding. Barrett Division, Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.

Dust Collectors

This folder tells how to build and select dust and mist collectors. Aget Mfg. Co., Adrian, Mich.

Motor Selection

Bulletin B-2103-1, 12 pages, presents selection data for alternating current motors—speed-frequency relationship, design classes, torque characteristics, frame selection tables and dimensional charts and mechanical modifications for all frame sizes 182 to 6085. Product Publicity Department, Reliance Electric & Engineering Co., 1088 Ivanhoe Rd., Cleveland 10, O.

Carbide Milling Cutters

This 4-page bulletin 11156 describes throwaway carbide inserts used by milling cutters. Another 4-page bulletin gives performance data of inserts that cut at speeds of 1000 sfpm and higher. Newcomer Products Inc., Latrobe, Pa.

Lift Trucks

Here's a bulletin that gives specifications of gasoline and LP-gas lift trucks with capacities of 2000 to 10,000 lb. Yale Material Handling Division, Yale & Towne Mfg. Co., 11000 Roosevelt Blvd., Philadelphia 15, Pa.

Pressure Gages

Bulletin DH-23, 4 pages, describes gages that withstand violent pressure pulsations and severe mechanical vibrations. Helicoid Gage Division, American Chain & Cable Co. Inc., 929 Connecticut Ave., Bridgeport 2, Conn.

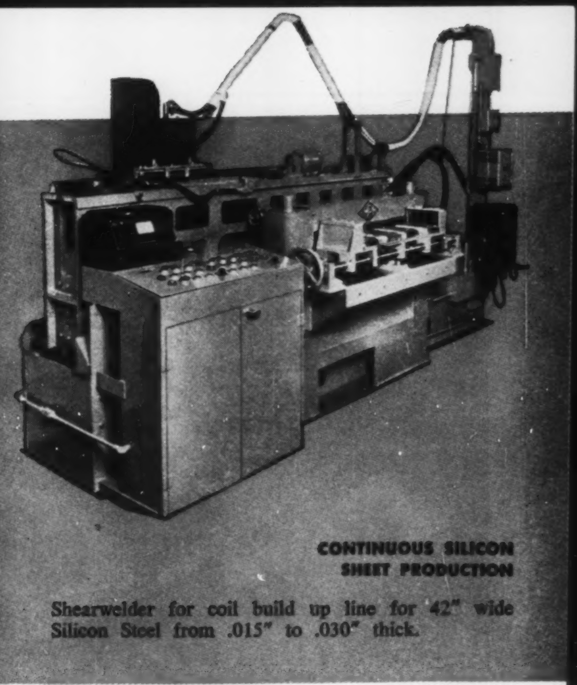
Process Instrumentation

Indicating, recording, controlling and transmitting instruments for flow, pressure and density are described in catalog 2, 32 pages. Fischer & Porter Co., 907 Jacksonville Rd., Hatboro, Pa.

Laminated Shims

This 8-page bulletin contains technical data on shims made of brass, mild steel, stainless steel and aluminum. Laminated Shim Co. Inc., Glenbrook, Conn.

THE NEW
MPM
Shear
Welder



CONTINUOUS SILICON SHEET PRODUCTION

Shearwelder for coil build up line for 42" wide Silicon Steel from .015" to .030" thick.

.....more automation for even faster Steel Production!

HEAVY GAUGE STAINLESS PRODUCTION

Shearwelder for butt welding 60" wide x .250" thick Stainless Steel.

● Metal Processing Machine Company's new Shearwelders are outstanding because of their advanced design incorporating automatically sequenced operations.

Shearing and welding are performed at the same station with positive clamping right at the work area, thereby insuring perfectly aligned butt welds.

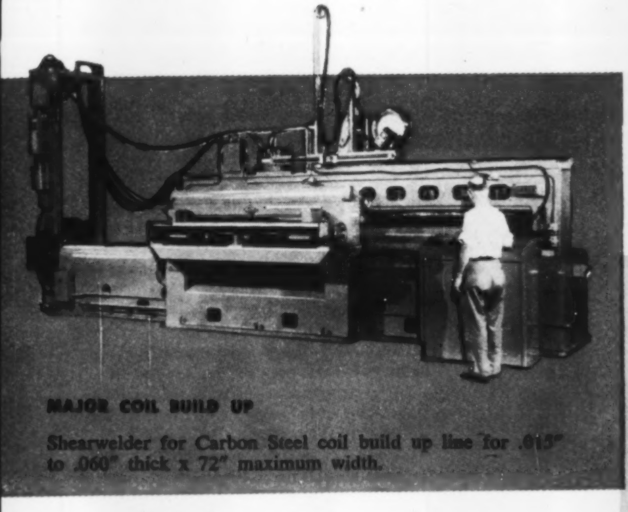
"M.P.M." welds are **extremely ductile,** permitting subsequent rolling, forming, or blanking operations. Weld joints are smooth and require **no trimming.**

Rugged construction is insurance for minimum maintenance and compact design saves floor space.

THE METAL PROCESSING MACHINE CO.

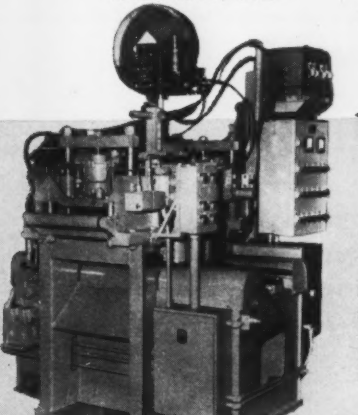
DIVISION OF McKAY MACHINE CO.
YOUNGSTOWN, OHIO

McK
MPM



MAJOR COIL BUILD UP

Shearwelder for Carbon Steel coil build up line for .015" to .060" thick x 72" maximum width.

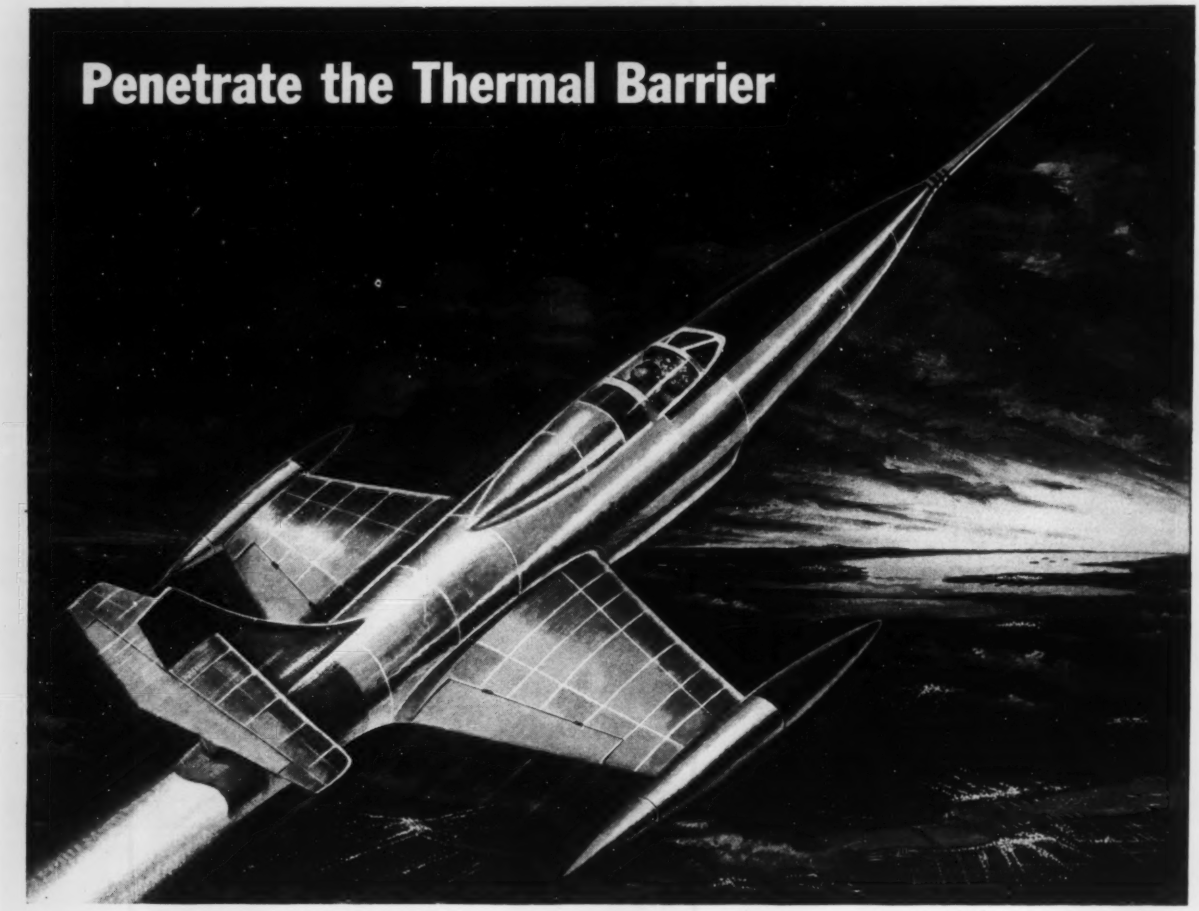


CONTINUOUS TUBE MILL PRODUCTION

Shearwelder used with strip looping device for splicing coil to coil to permit continuous production of tube mill.

10065

Penetrate the Thermal Barrier



MicroMach extra-high-tensile stainless steel sheets up to 48″ WIDE *for aircraft and missile use*

As the speed of today's aircraft rapidly approaches the Thermal Barrier, conventional metals are being left far behind in the race to satisfy the structural requirements of supersonic craft. Needed are metals that can withstand the intense heat caused by air friction at high speeds and still retain their strength. One such metal, MicroMach stainless, has been in use for more than a year.

MicroMach is a special aircraft and missile grade of modified type 301 stainless steel sheet furnished to higher mechanical properties than are available in other commercial high tensile grades in the full hard condition.

These sheets are rolled to extremely close tolerances (as low as plus or minus 3%) with micro-accuracy and precise uniformity of gauge. The surface of MicroMach sheet is smooth, clean and dense; qualities so important in minimizing surface friction.

For further information write to Aircraft Steels Dept.

Washington Steel Corporation
1-0 WOODLAND AVENUE
WASHINGTON, PA.

MicroRold stainless steel is also available in all popular grades and to meet regular government specifications. Sheets up to 36″ wide can be had as thin as .005″, and over 36″ to 48″ wide as thin as .010″ in all commercial finishes and tempers.

PRECISION WASHERS

For automatic transmissions and similar bearing applications

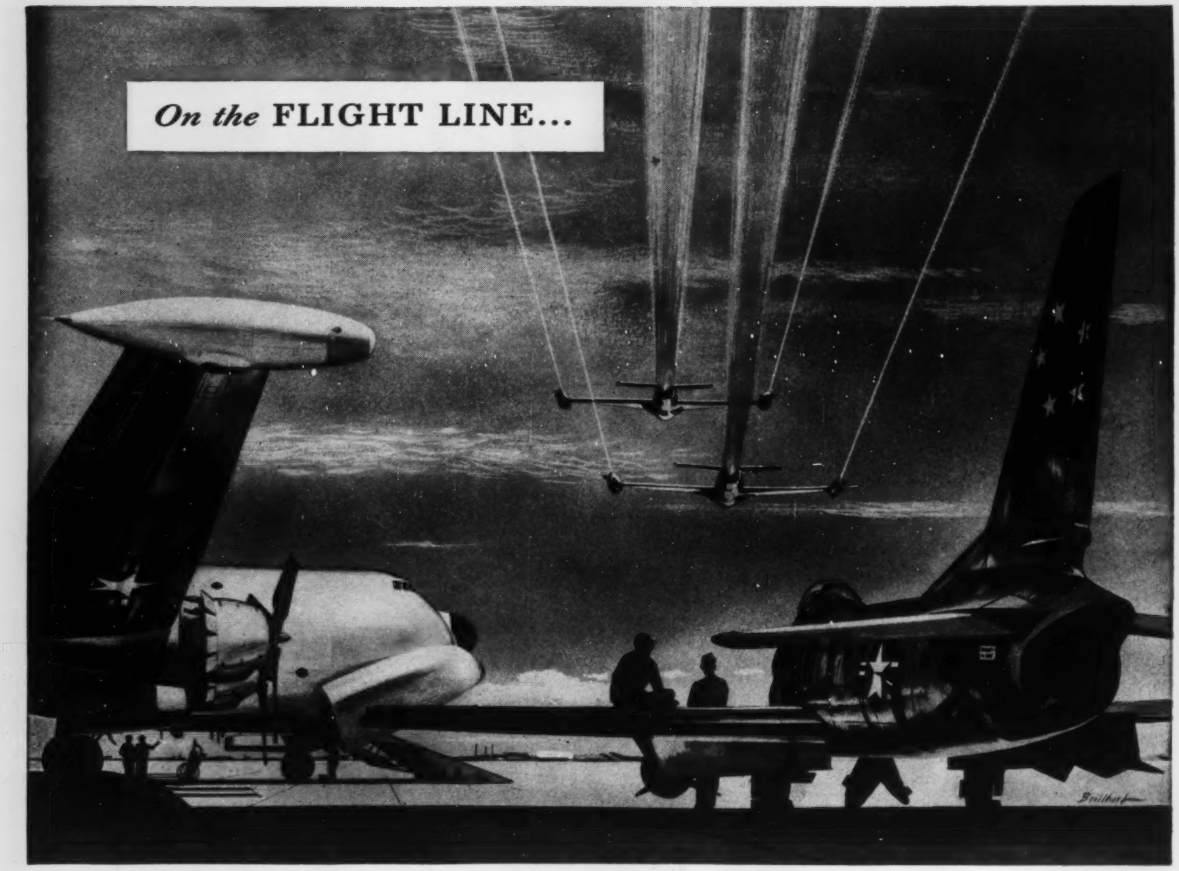
Solid steel or bronze; steel faced with babbitt or copper-lead, or copper-lead on *both faces*. Flat, spherical or special shapes. Grooves, holes, nibs, scallops or lugs. O.D. 1″ to 6″. Wall thickness: solid, .028″ to .141″; bimetal, .034″ to .141″. Cold rolled for heavy-duty. Large capacity. Complete engineering service.

FEDERAL-MOGUL DIVISION

FEDERAL-MOGUL-BOWER BEARINGS, INC., 11051 SHOEMAKER, DETROIT 13, MICHIGAN

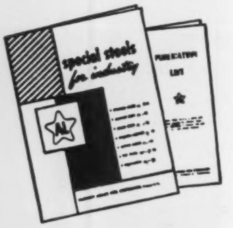
RESEARCH • DESIGN • METALLURGY • PRECISION MANUFACTURING

On the FLIGHT LINE...



FIRST COST *can be the* LEAST COST

if it's the LAST COST



WRITE TODAY
For These Publications

1. SPECIAL STEELS FOR INDUSTRY . . . 16 pages of essential data on the proper selection and application of principal AL special alloy products: stainless, tool and electrical steels and sintered carbides.

2. PUBLICATION LIST . . . a complete listing of all AL publications, both technical and nontechnical (over 100 in all), with a handy order form for your convenience.

ADDRESS DEPT. S-85

★ ★ ★ ★ The Allegheny stainless and super high-temperature steels used in jet and rocket aircraft engines and equipment are pure economy, because they do the job that's required of them, and they *last!* They stand up under metal-killing conditions of heat, load and corrosion, and they're dependable.

There are lots of other jobs for stainless steel that aren't as spectacular, or perhaps as tough, as those aboard a jet. Like, for example, in hospital or kitchen equipment—or in cars, trains, appliances, buildings, etc. But, in these and thousands of other cases, stainless again gets the call. And usually, it's for the same big reason . . . because it not only does the job better, but lasts longer and costs less in the long run than any other material on the market.

And that brings up this question: where can Allegheny Stainless help *you* either to make money, or to save it? If you have a product or equipment problem, call us in . . . let our Engineering and Research Staff lend a hand. *Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh 22, Pa.*

W&D 5599 B

Make it BETTER—and LONGER LASTING—with

AL Stainless Steel

AL ALLEGHENY LUDLUM ®

Warehouse stocks carried by all Ryerson Steel plants

AS IN THE PAST HALF CENTURY

the trend is to Thomas

for '57

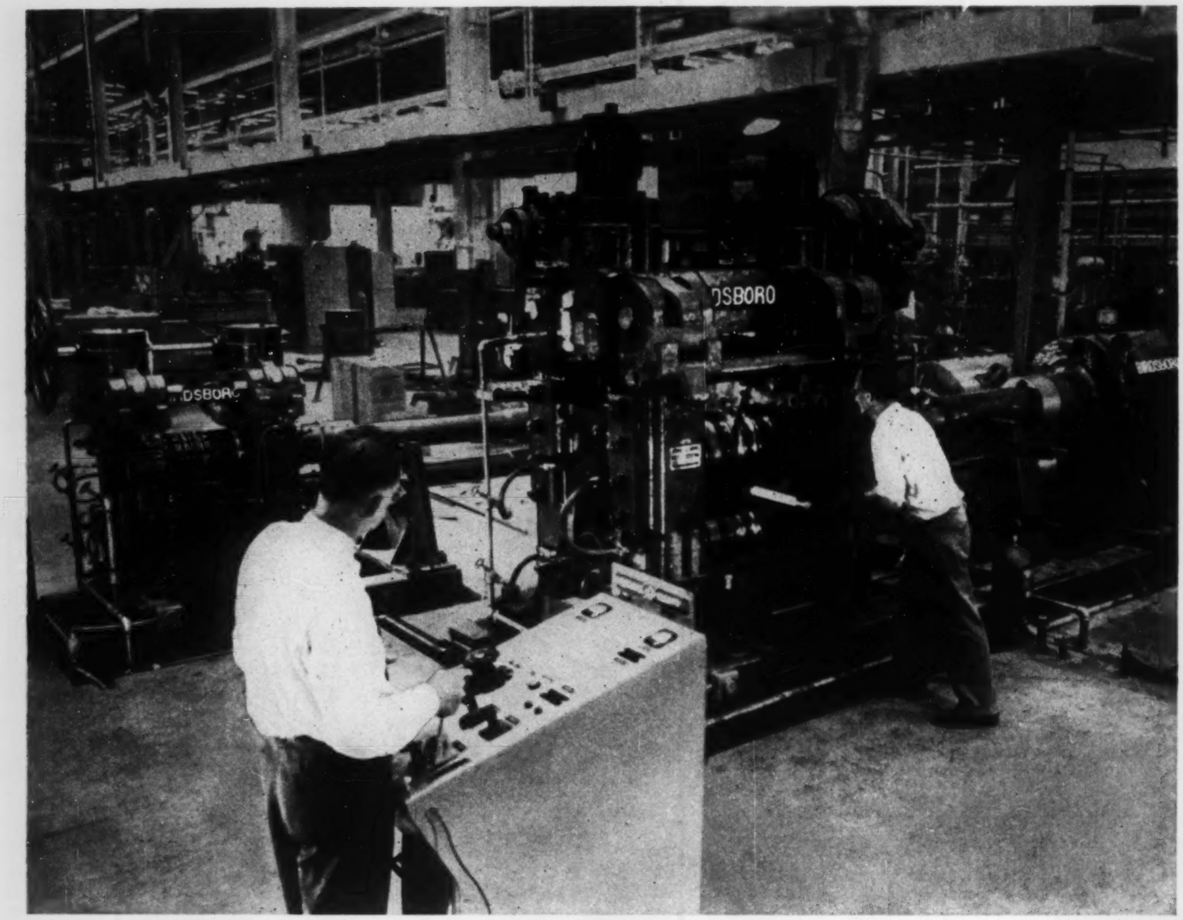
For over 50 years Thomas has served the steel industry with equipment designed to increase output and decrease operating costs. Make sure the equipment you buy meets the needs of today...specify THOMAS.

ABOVE — Single-crank straight-side press, one of many Thomas models

THOMAS
MACHINE MANUFACTURING CO.

43

Punches · Shears · Presses · Benders · Spacing Tables



General Electric explores new areas with experimental mill by BIRDSBORO

● New metals are coming on the market, but only through experimentation can their capabilities be determined. In Schenectady, N.Y., General Electric has installed in its new laboratory a Birdsboro 16″-10″ bar mill, designed to help scientists seek out the unknown factors of these new metals through experimentation and specialized production.

The mill features 2 stands of different pitch diameter to accommodate the large range of product size required. The 16″ roughing mill includes a motorized screwdown for high speed roll setting when performing slabbing operations. It also permits use of a bull head and grooved passes to get a wide range of product with a minimum of roll changing.

Again, Birdsboro has developed a mill that not only sets the pace in design, but through expert utilization by General Electric will help in opening new fields in metals production. When extraordinary results are desired, more and more companies turn to Birdsboro . . . and it pays! For more details of Birdsboro leadership in customized mill machinery, write to:

Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
District Office: Pittsburgh, Pa.
Engineering Subsidiary: Engineering Supervision Co.
120 W. 42nd St., New York 36, N.Y.

MM56-56

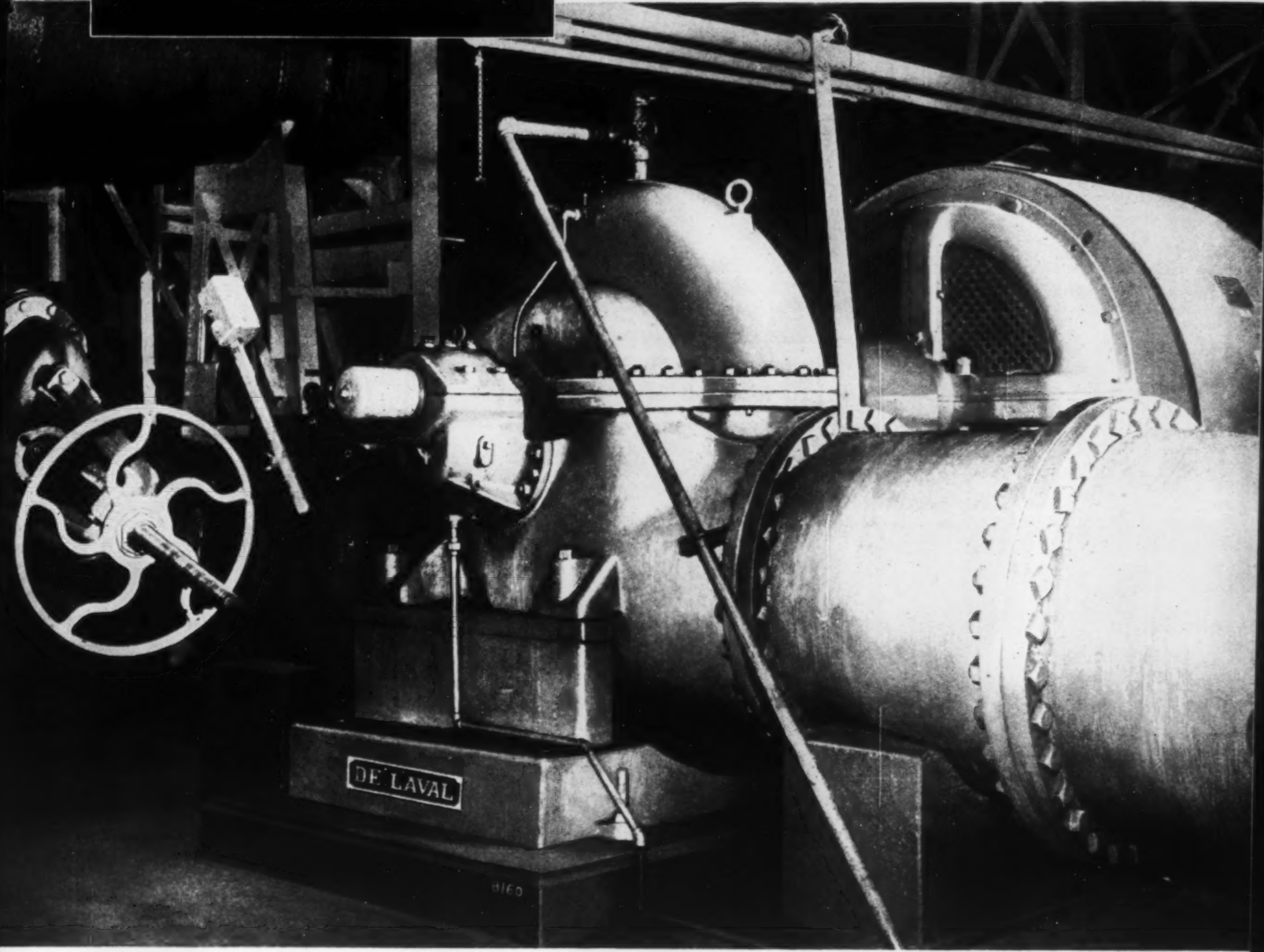
BIRDSBORO
STEEL FOUNDRY AND MACHINE CO.

STEEL MILL MACHINERY • HYDRAULIC PRESSES (Metalworking and Extrusion) • CRUSHING MACHINERY • SPECIAL MACHINERY • STEEL CASTINGS • "CAST-WELD" Design • ROLLS: Steel, Alloy Iron, Alloy Steel

DE LAVAL

CENTRIFUGAL PUMPS

in service since 1911 at Inland Steel Co.



De Laval Centrifugal Pumps have a record of dependability at the Inland Steel Co., which goes back forty-five years. In that time, De Laval has supplied this major producer with pumps for practically every steel mill service—*more than 75 units in all.* The photograph shows one of the largest De Laval pumps on the line at the East Chicago, Indiana plant of Inland Steel. The unit delivers 20,000 gpm at 120 ft head.

De Laval Centrifugal Pumps are available for a wide range of applications in all types of metal-working plants. Types L, M and P single stage double suction pumps can handle capacities from 1,000 to 20,000 gpm and heads to 350 feet. Larger De Laval units of any capacity to meet any requirement for steel mill service are available.

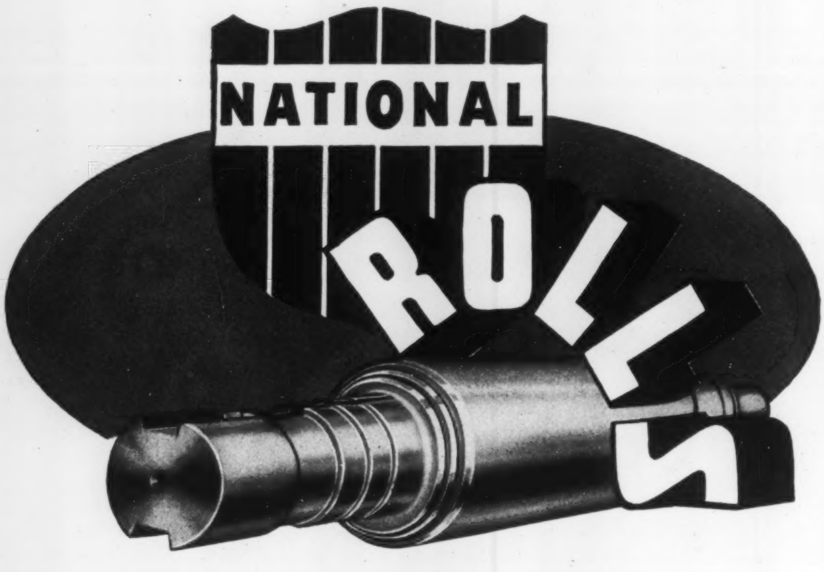
Send for Bulletin 1004 giving performance and application data.

DE LAVAL *Centrifugal Pumps*

DE LAVAL STEAM TURBINE COMPANY
860 Nottingham Way, Trenton 2, New Jersey

DL366

Now—TO BETTER SERVE YOUR ROLL REQUIREMENTS



On January 1, National Roll & Foundry became an operating division of General Steel Castings Corporation.

National Roll now offers its customers the additional benefits and services made possible by this closer relationship with General Steel Castings—its many years of specialized foundry experience, and its capable staffs of engineering and production specialists.

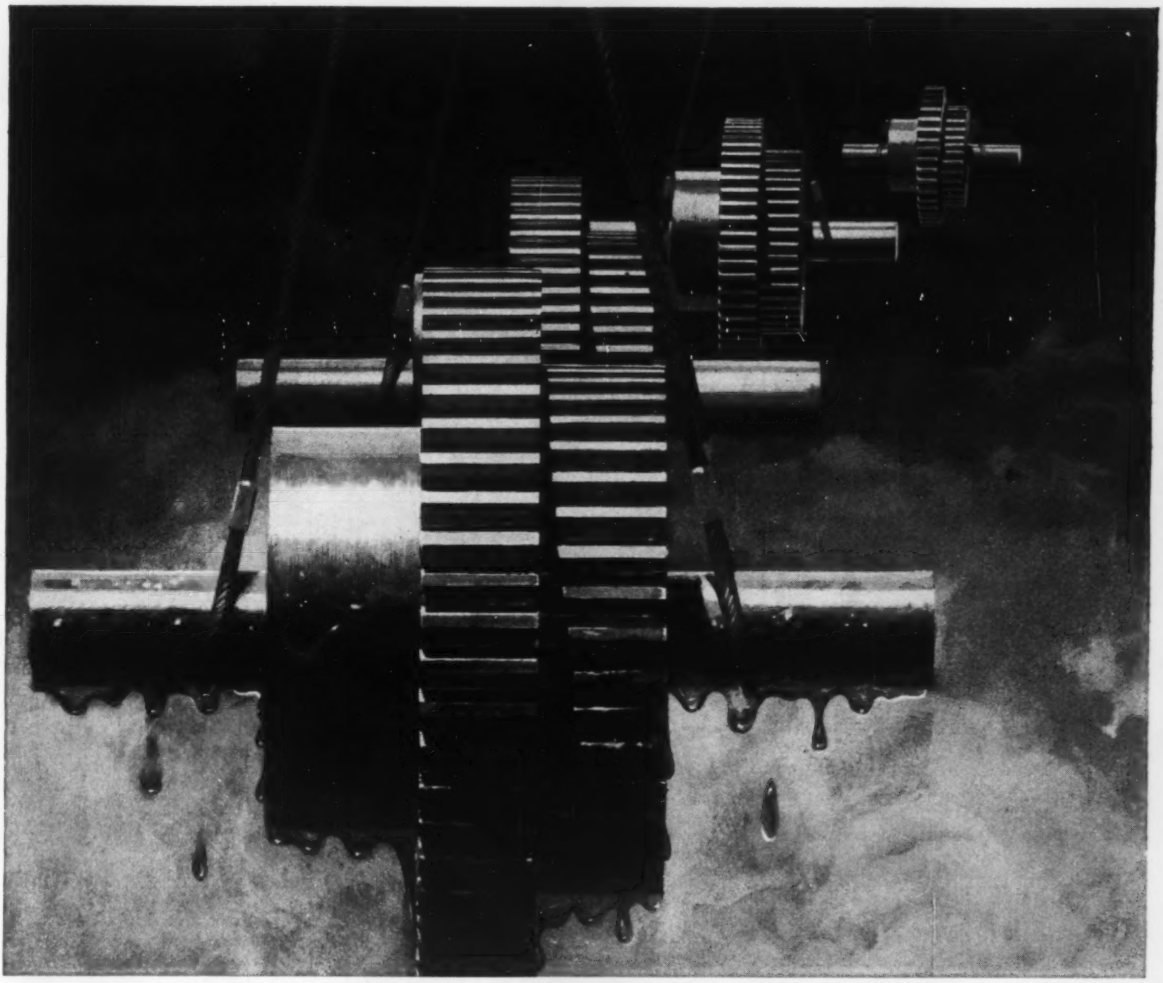
We are sure old friends, whose companies we have served for many years, and the new friends we hope to meet and serve in the future, will find National Roll & Foundry better equipped to better serve their roll and casting requirements.

GENERAL STEEL CASTINGS CORPORATION

NATIONAL ROLL & FOUNDRY DIVISION

Avonmore (Westmoreland County) Pennsylvania

General Steel Castings Corporation: General Offices, Granite City, Ill. • Plants: Granite City, Ill.—Eddystone, Pa.—Avonmore, Pa.



The "built-in" stability of Columbia-Southern Trichlor enables the solvent to be used over and over again

fast, efficient, economical vapor degreasing with Columbia-Southern Trichlorethylene

Columbia-Southern, the world's leading merchant producer of chlorine, is an important producer of trichlorethylene . . . the preferred solvent for metal cleaning by vapor degreasing.

Metal cleaned by Columbia-Southern Trichlor is dry and grease-free, ready for further fabrication, finishing, painting, and in many instances, for plating. The degreasing is rapid and efficient . . . completely cleaning even the most intricate forms or parts.

Columbia-Southern Trichlor is a product of very high quality. It is nonflammable, has a high vapor density and low boiling point which keeps vapor losses low.

Columbia-Southern Trichlor is extremely stable . . . the result of an exclusive development in Columbia-Southern's own laboratories, known as *neutral type stabilization*. The solvent is protected from the action of light, heat, oxygen, and acids. It is unaffected by moisture. This stability is "built-in" and remains after repeated distillations.

Columbia-Southern Trichlor is available in tank cars, tank trucks, and drums.

For further information on the use of Trichlor for vapor degreasing, you are invited to write today to your nearest Columbia-Southern sales office or to your solvents distributor.

COLUMBIA-SOUTHERN CHEMICAL CORPORATION
SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY
ONE GATEWAY CENTER · PITTSBURGH 22 · PENNSYLVANIA

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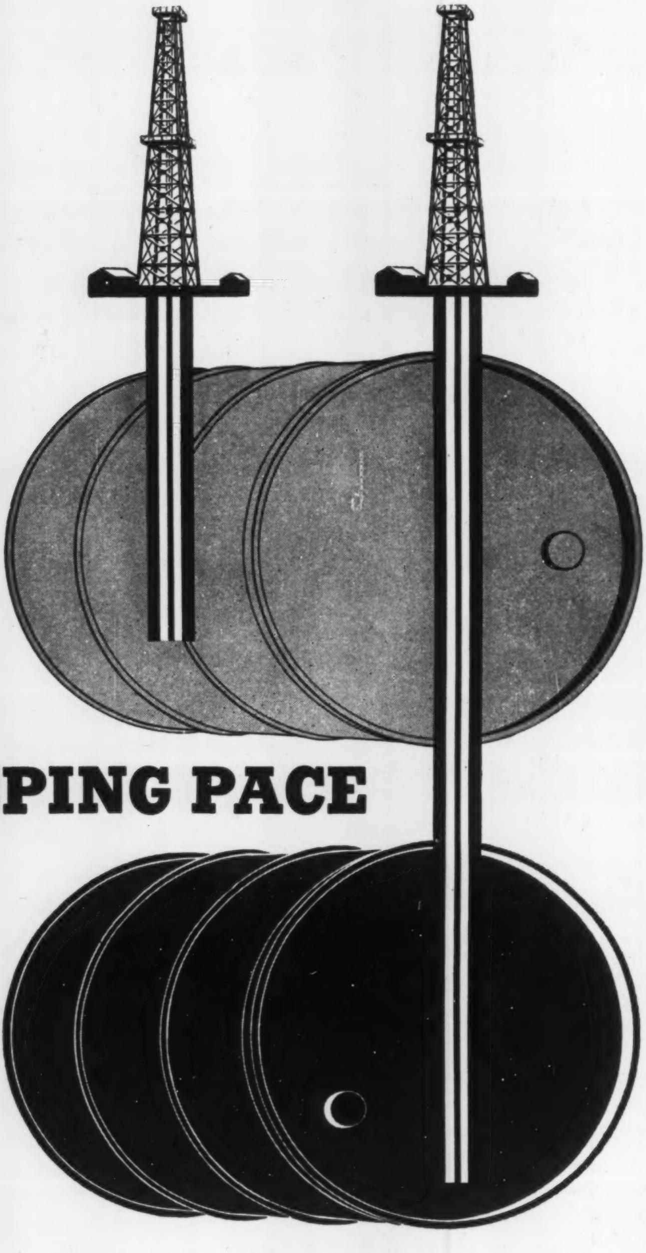
IN CANADA: Standard Chemical Limited and its Commercial Chemicals Division



KEEPING PACE

Drills were chewing their way down for about 2000 feet in the search for oil in 1916. Today's drilling depth is more than double that.

The change in drilling that forty years has brought well symbolizes many advances in the petroleum and chemical industries. Engineers have dug more deeply into the secrets of nature, too . . . have designed plants and processes to wrest new products and services from petroleum, ores and elements.

We mentioned 1916 because that is the year Sun Ship was founded. It has long served the swift-growing needs of petroleum and chemical industries. Year by year, the engineering skill and facilities of the great Sun Ship plant have proven their ability to meet the demands for plant and equipment keyed to the swift pace of progress in these and other important fields. Sun Ship keeps pace with progress.

Sun

SHIPBUILDING & DRY DOCK COMPANY

SINCE 1916

ON THE DELAWARE • CHESTER, PA.

Spring steel within this range...

FOR THE MOST EXACTING NEEDS KNOWN TODAY!

- That this is the age of specialization is certainly true in the use of steels. And in this regard *Athenia Steel* customers benefit especially by two not-too-common factors. First, by extreme control of quality and uniformity, unsurpassed, seldom equalled *anywhere!* Secondly, by painstaking technical service to determine or develop precisely the right steel for any special need.

Here at Athenia we concentrate on cold rolled high carbon flat steels, custom made of .45 carbon and higher, in widths from .015″ to 16″ and thicknesses from .001″ to .065″. Full range of finishes and tempers. We also produce special narrow width stainless, and the new super-tough, corrosion resistant spring material, Nilcor*.

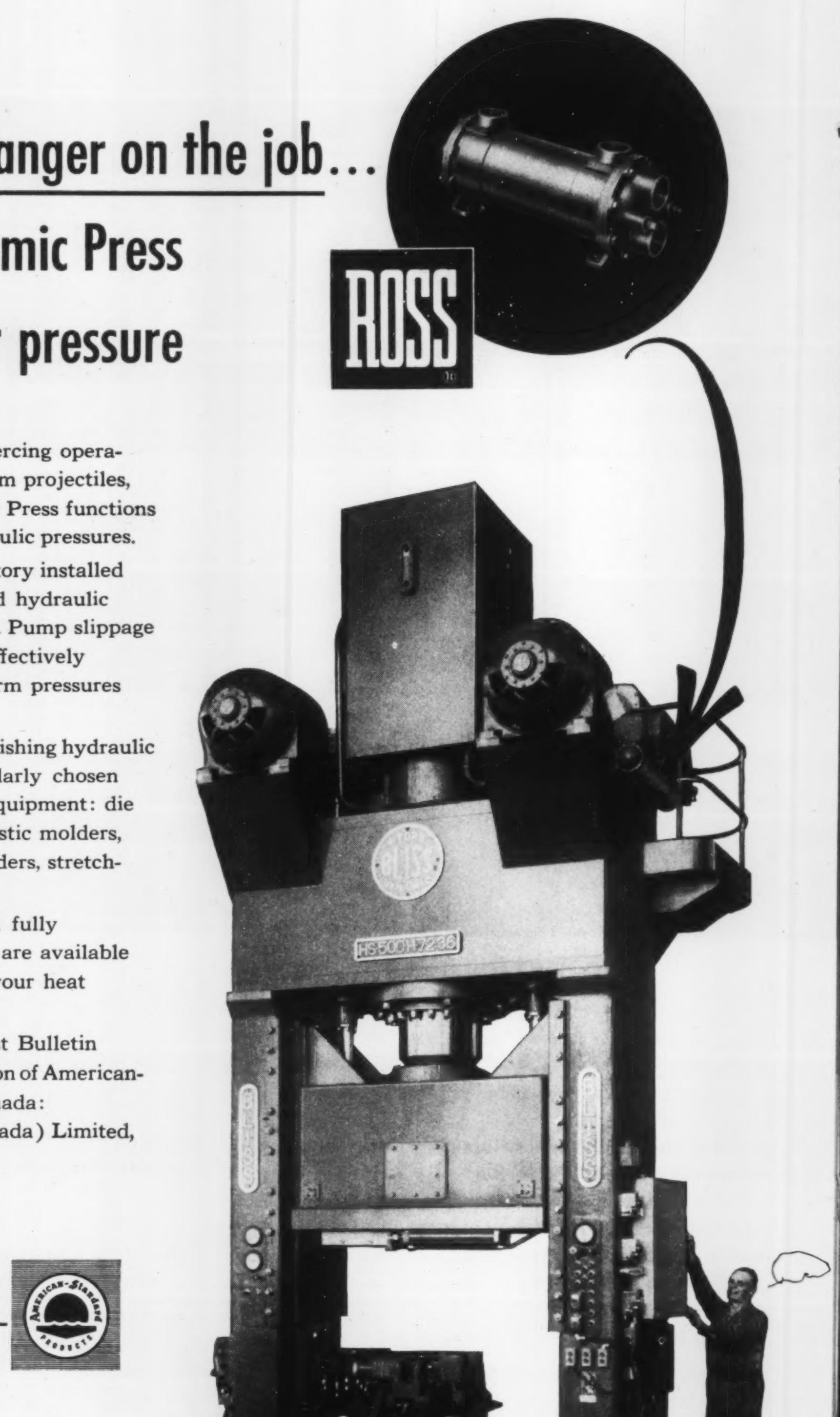
For a new and profitable experience in service and in steel controlled precisely to *your* needs . . . try us!

*Trade Mark National-Standard Company

NATIONAL STANDARD

DIVISIONS: NATIONAL-STANDARD, Niles, Mich.; *tire wire, stainless, music spring and plated wires* • WORCESTER WIRE WORKS, Worcester, Mass.; *high and low carbon specialty wires*
WAGNER LITHO MACHINERY, Secaucus, N. J.; *metal decorating equipment* • ATHENIA STEEL, Clifton, N. J.; *flat, high carbon spring steels* • REYNOLDS WIRE, Dixon, Ill.; *industrial wire cloth*

With a Ross Exchanger on the job... Bliss Hydro-Dynamic Press keeps cool under pressure



Performing hot gabbaging and piercing operations in the manufacture of 105 mm projectiles, this 500 ton Bliss Hydro-Dynamic Press functions with accurate and consistent hydraulic pressures.

Rated power is insured by a factory installed Ross Exchanger, furnished to hold hydraulic temperatures in check *at all times.* Pump slippage from over-heated, thinned oil is effectively prevented, thereby assuring uniform pressures of known intensity.

Ruggedly built to withstand punishing hydraulic shock, Ross Exchangers are regularly chosen for numerous types of hydraulic equipment: die casters, metal drawing presses, plastic molders, extrusion presses, fluid drives, welders, stretch-wrap formers, and many others.

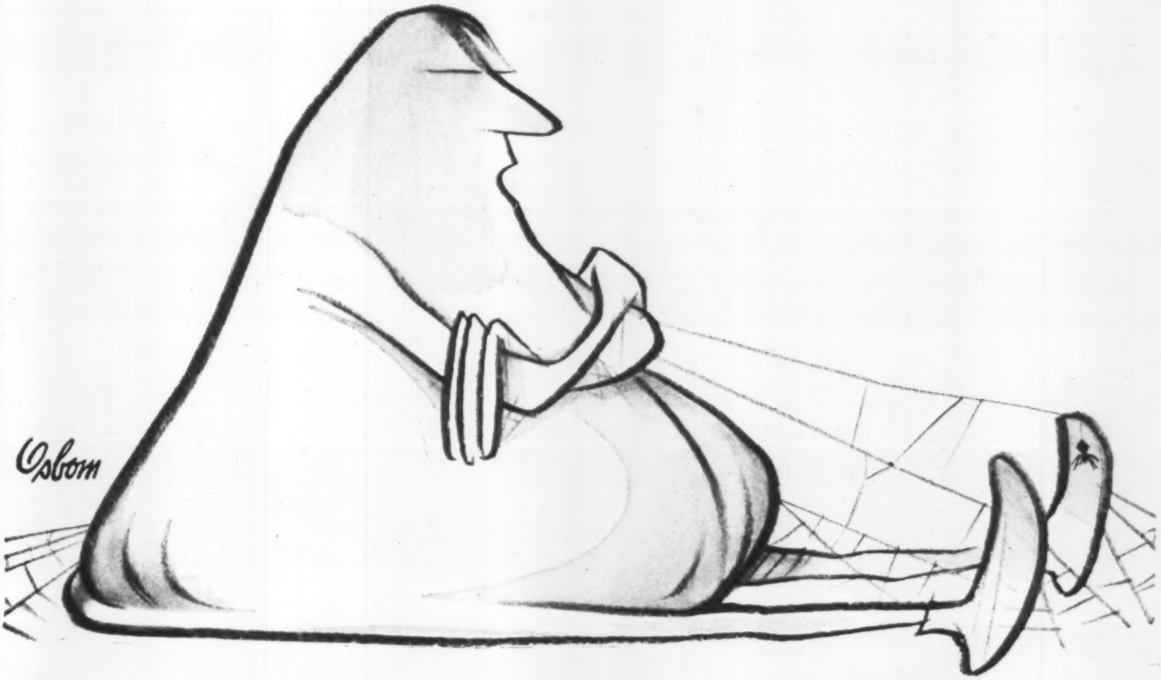
Completely pre-engineered and fully standardized, these compact units are available in a wide range of sizes to meet your heat transfer requirements.

For detailed information request Bulletin 1.1K5. Ross Heat Exchanger Division of American-Standard, Buffalo 5, N. Y. In Canada: American-Standard Products (Canada) Limited, Toronto 5, Ont.

ROSS HEAT EXCHANGER

Division of AMERICAN - Standard

AMERICAN-Standard PRODUCTS



INERTIA ...can cost you money if you still specify bulky cast or forged circular parts. Here's how you can save three ways.

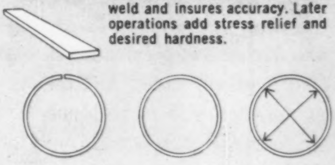
Cut costs three ways with circular parts from Cleve-Weld

1. Cut your waste costs up to 30% over bulky cast or forged parts.
2. Reduce finished machining time to a minimum.
3. Speed your overall production.

From simple gear blanks to special alloy jet rings, the Cleve-Weld Process gives the same results—better performance and reduced costs. *Often the savings in machine time and material waste alone pay for the finished Cleve-Weld part.*

Find out the full story on how Cleve-Weld's 45 years of design, metallurgical and production experience can save you money, improve your product. Write or send drawings to Circular Welded Products Sales Department at address below.

THIS IS THE BASIC CLEVE-WELD PROCESS. Rectangular bars or special contoured sections of steel are rolled into a circular form. Next, the part is welded and then expanded into a true circle. This tests the weld and insures accuracy. Later operations add stress relief and desired hardness.



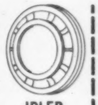
EXAMPLES OF CLEVE-WELD PROCESS PRODUCTS

JET RINGS

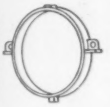
TRUCK RIMS

GEAR BLANKS

MOTOR HOUSINGS


IDLER WHEELS

BANDS


TRUNNIONS

Another AmF Product
CLEVE-WELD PROCESS
RIMS • RINGS • WELDMENTS

CLEVELAND WELDING DIVISION
AMERICAN MACHINE & FOUNDRY COMPANY
Cleveland 11, Ohio

SEND THIS COUPON NOW
Cleveland Welding Division S-71
American Machine & Foundry Company
West 117th Street and Berea Road
Cleveland 11, Ohio

Please send me your brochure on the cost-cutting Cleve-Weld Process.

Name________________________

Title________________________

Attach to your company letterhead and mail

BLISS HIGH PRODUCTION PRESSES "do-it-themselves" at Black and Decker

Just three Bliss High Production Presses produce the millions of motor laminations Black and Decker uses in its complete line of more than 150 portable power tools!

Running in the upper speed range, sometimes at well above 250 strokes per minute, through two shifts a day—and occasionally three. And they've been doing it for a long time now with no problems.

Of course, H-P presses are built for speed. Extra heavy cast Meehanite frame • *Square* gibbing • Automatic lubrication • Variable speed drive • Special air friction clutch • Counterbalanced crankshaft. Every feature has been especially designed to maintain precision at top speeds. That adds up to top production rates, longer die life.

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If production of short-stroke stamped parts is your problem, long run or short, you'll want to learn more about Bliss H-P presses. Our recently revised 32-page catalog No. 27-C describes the entire line and gives examples of the wide range of work you can accomplish with these presses. Why not write for a copy today.

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SINCE 1857

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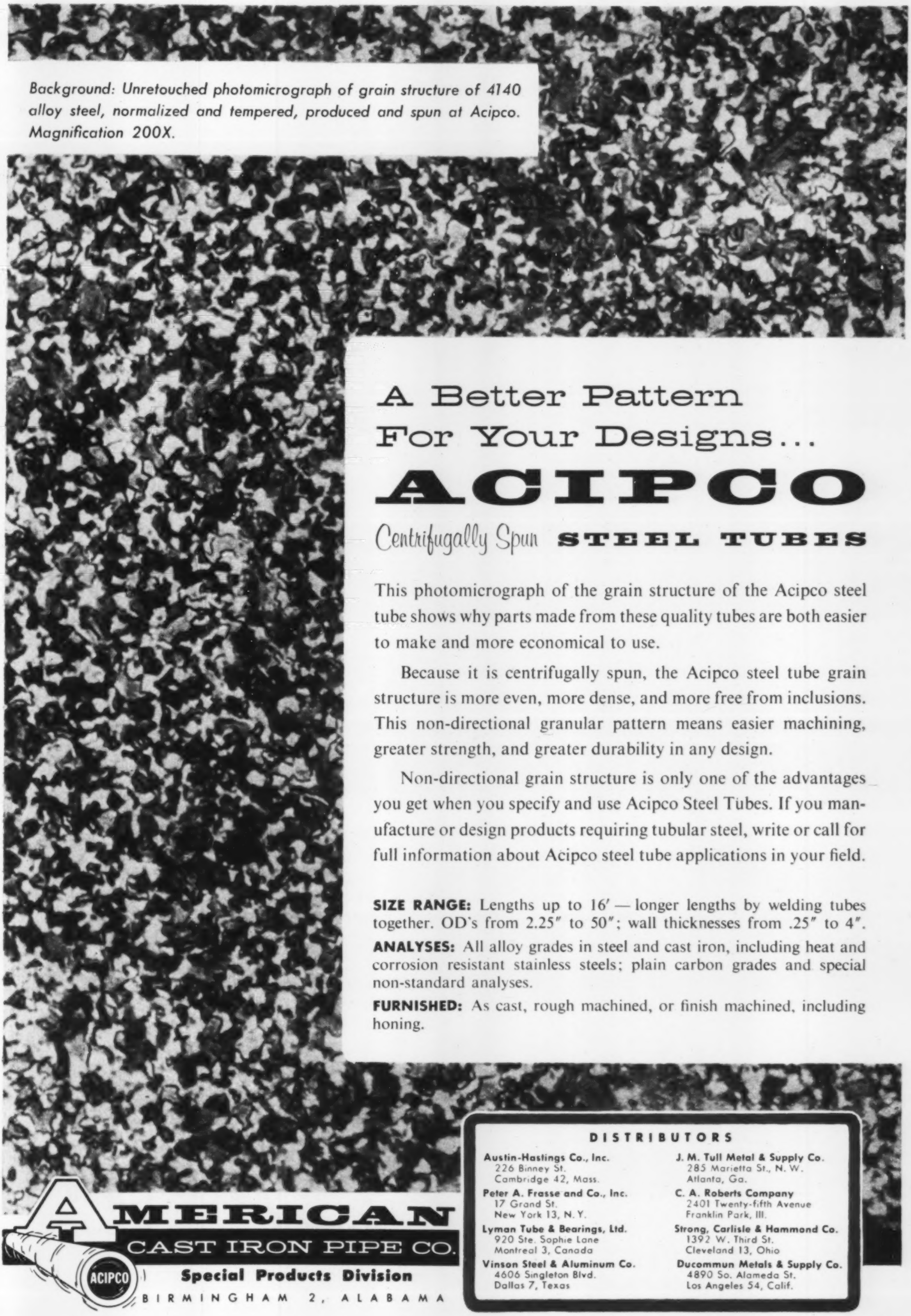
U. S. Plants in Canton, Cleveland, Salem and Toledo, Ohio; Detroit and Hastings, Michigan; Midland and Pittsburgh, Pa.; San Jose, California; *Branch Offices* in Boston, Burbank, Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, San Jose, Salem, Toledo, Washington, D. C.; and Toronto, Ontario, Canada; E. W. Bliss (England) Ltd., Derby; E. W. Bliss Co. (Paris), France. *Other representatives throughout the world.*

E. W. BLISS COMPANY, CANTON, OHIO • Presses, Rolling Mills, Rolls, Special Machinery



Background: Unretouched photomicrograph of grain structure of 4140 alloy steel, normalized and tempered, produced and spun at Acipco. Magnification 200X.

A Better Pattern For Your Designs...

ACIPCO

Centrifugally Spun STEEL TUBES

This photomicrograph of the grain structure of the Acipco steel tube shows why parts made from these quality tubes are both easier to make and more economical to use.

Because it is centrifugally spun, the Acipco steel tube grain structure is more even, more dense, and more free from inclusions. This non-directional granular pattern means easier machining, greater strength, and greater durability in any design.

Non-directional grain structure is only one of the advantages you get when you specify and use Acipco Steel Tubes. If you manufacture or design products requiring tubular steel, write or call for full information about Acipco steel tube applications in your field.

SIZE RANGE: Lengths up to 16′ — longer lengths by welding tubes together. OD's from 2.25″ to 50″; wall thicknesses from .25″ to 4″.

ANALYSES: All alloy grades in steel and cast iron, including heat and corrosion resistant stainless steels; plain carbon grades and special non-standard analyses.

FURNISHED: As cast, rough machined, or finish machined, including honing.

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DEDICATED TO AMERICAN MIGHT...
AIRCRAFT-QUALITY STEELS* by *Acme-Newport Steel*

**Plate, sheet and strip in alloy and carbon grades*

Because there must be no compromise on quality in defense equipment, prime and subcontractors buy increasing tonnages of Acme-Newport aircraft-quality alloy and carbon steels. For planes, guided missiles, Jato rockets and other vital defense products they purchase plate, sheet and strip, including the popular chrome-molybdenum AISI 4130 type. Acme-Newport long has been famous for the experience, methods and modern facilities employed to meet every individual specification . . . for clean, sound, chemically accurate alloy and carbon steels with proper response to heat treatment. Such dependability obviously is indispensable at this time. Let Acme-Newport demonstrate what they can do for you.

Acme-Newport Steel
COMPANY
NEWPORT, KENTUCKY
A SUBSIDIARY OF ACME STEEL COMPANY

STEEL

January 7, 1957

Market Outlook

STEEL DEMAND should reach a new high this year.

This is indicated by a survey this publication made: The metalworking industry expects its 1957 sales to reach a record high of $145 billion, a 7.4 per cent increase over 1956's $135 billion.

SIGHTING A RECORD— While some of the rise in dollar volume will stem from price increases, it's unlikely that all of it will. Forecasts by members of the steel industry are for a record 120 million net tons of steel for ingots and castings in 1957, a 4.3 per cent step-up over 1956's 115 million tons. The previous record was 1955's 117,036,085 tons.

RECORD CAPACITY— Production of 120 million tons would mean an operating rate of 90 per cent of capacity, based on the new official annual capacity figure for 1957 of 133,459,150 net tons, compared with 1956's 128,363,090 tons. The 1956 output of 115 million tons of steel for ingots and castings represented 89.6 per cent of the official capacity for that year.

BIGGER GROWTH— Capacity will continue to grow this year—probably more than it did in 1956. The steel industry has around 15 million tons of new steelmaking capacity under construction, and around 6 million tons of it should be completed this year, compared with 3.6 million last year.

LABOR PEACE— The steel industry's production efforts should not be hurt this year—or next—by labor troubles that have plagued it at the midpoint of so many of the postwar years. The three-year contract signed in 1956 by the industry and the steelworkers should prevent that.

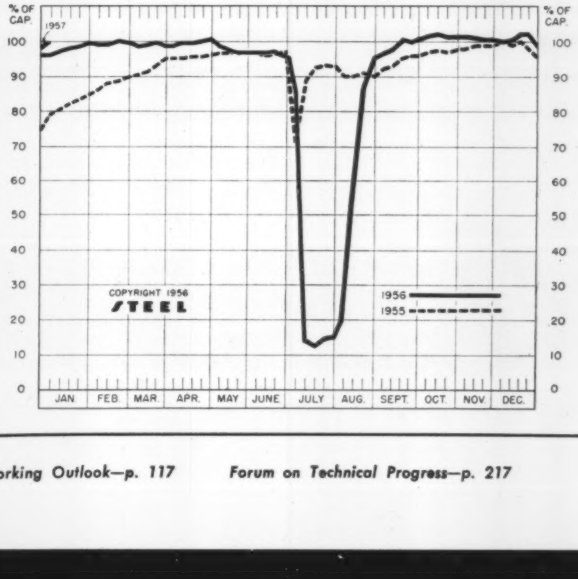
The contract will result in increased labor costs. Wage increases are specified for July 1, 1957, and July 1, 1958. Cost-of-living increases also are provided—they are based on the government's consumer price index. The first of these just became effective. It gives steelworkers a raise of 3 cents an hour.

PRICES WILL RISE— These labor cost increases, along with price jumps in most raw materials, will bring further price advances on steel. At the end of 1956, steel was costing the user around 9 per cent more than it did at the start of the year.

MIXTURE— The year starts with mixed demand for steel. A few products, like heavy plates and wide flange structural shapes, are in extremely strong demand, while others, like merchant wire products and cold-finished carbon bars, are available immediately. There's no sign of a letup in demand for plates, what with the tanker program that's being superimposed upon the needs of the construction industry, the railroad freight car builders, and others. The demand for plates is spilling over onto the hot-rolled sheet mills. One steel company is using its hot-rolled sheet mill to produce light-gage (about 5/16-in.) soft steel plate in coils. By coiling the plate, the producer can make it with the same equipment it uses for hot-rolled sheet and keep its production high. The consumer has worked out a means of uncoiling and flattening the plate.

While over-all demand for steel is not frantic, it is comfortable—enough so that the mills produced steel at 100 per cent of capacity at the turn of the year.

NATIONAL STEELWORKS OPERATIONS



DISTRICT INGOT RATES

(Percentage of Capacity Engaged)

	Week Ended Jan. 6	Change	Same Week 1956	Same Week 1955
Pittsburgh	100	+ 7	98	78
Chicago	100.5	— 3	99	85.5
Mid-Atlantic	102	+ 3	96	72
Youngstown	104	+19	100	86
Wheeling	101	+ 9*	98.5	94.5
Cleveland	104	+13	96.5	94.5
Buffalo	107.5	0	105	100
Birmingham	94.5	0	93.5	74.5
New England	72	0	92	74
Cincinnati	90	0	88.5	72.5
St. Louis	90	+26	99	78.5
Detroit	103	+ 8.5*	100	80.5
Western	103	0	103	73
National Rate	100	+ 1	97	80.5

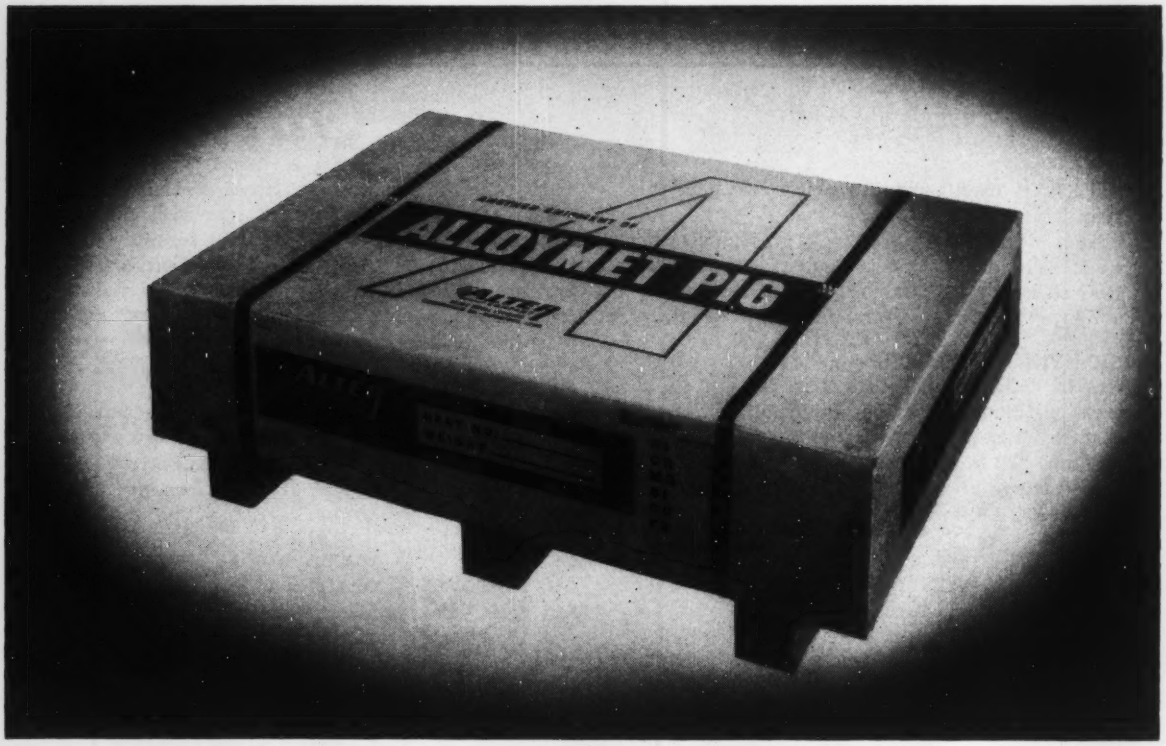
INGOT PRODUCTION‡

	Week Ended Jan. 6	Week Ago	Month Ago	Year Ago
INDEX (1947-1949=100)	(N.A.)	147.5†	155.2	149.6
NET TONS (In thousands)	(N.A.)	2,370†	2,493	2,403

*Change from preceding week's revised rate. †Estimated. ‡Amer. Iron & Steel Institute. (N.A.) Not available.

Weekly capacity (net tons): 2,559,490 in 1957; 2,461,893 in 1956; 2,413,278 in 1955.

Metalworking Outlook—p. 117   Forum on Technical Progress—p. 217



NEW "BOX LUNCH" of NICKEL ALLOY

speeds feeding of electric furnaces

26 nickel alloy pigs, each weighing about 50 pounds, travel inside this new palletized package. Weight and certified analysis are in plain view at all times. All fiberboard, it can go into the electric furnace "as is." It weighs only 1/4 as much as a wooden pallet. Saves on transportation costs. Discourages pilferage. Speeds handling.

Users are already enthusiastic about this new nickel alloy package. Like the quality product it contains, it serves as a further example of the exacting care Alter Company exercises in every phase of the production of alloy metals.

If you are still using scrap for your alloy requirements, ask us about Alloymet pig of certified analysis.

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World's largest producer of secondary nickel alloys of certified analysis

Major Industrial Components

(Per cent of respondents)

Three months from now inventories will be:

	Higher		Lower		Same
Castings[1]	19	←	12	→	69
Other formed components[2]	9	←	20	→	71
Machined components[3]	24	←	12	—	64
Fasteners	16	←	16	—	68
Electrical equipment & motors	25	←	15	—	60
Mechanical rubber goods & belting	12	←	10	—	78

Legend: Arrows show trend since STEEL's last report.

[1] Die, gray iron, malleable, nonferrous, steel.

[2] Forgings, stampings, springs, wire shapes.

[3] Bearings, couplings, cylinders, gears, screw machine products

Confidence Brings Build-Up

With inventories in balance and buyers expecting a good first half, there will be a moderate increase in component stocks during the first quarter

THE AVERAGE manufacturer is holding a 30 to 60 days' inventory of major industrial components, STEEL's latest quarterly survey reveals. The end of 1956 sees the effects on the steel strike gone (as far as components supplies are concerned).

The last report showed buyers still working off excessive inventories built up during the strike in fear of prolonged shortages (STEEL, Oct. 1, p. 277).

With a Bang—A year ago, 30 per cent of the respondents planned to step out with the new year and add to their stocks. This year, too, buyers want to build, but not to such an extent. About 20 per cent will do so in the first quarter.

That represents a decided shift from the story of three months ago. This survey shows that inventories were cut in all categories in 1956's fourth quarter, with the exception of forgings, stampings, springs, wire shapes and fasteners. Now all categories will be built up—with those exceptions.

The shift in thinking is most pronounced with machined components like bearings, couplings, cylinders, gears and screw machine products. One of four will increase stocks next quarter. The same number cut stocks last quarter. Over 15 per cent of the respondents report bearings give them delivery trouble, so there's reason for concern.

Good Shape—The only other noteworthy trouble is with some castings: About 15 per cent have trouble on delivery of one or more types, with steel castings being the hardest to find.

Of significance in this sort of survey: Only a few respondents are having enough difficulty with components inventories to comment on their troubles at any length. And when comments do come, they are almost always in terms of the shortage of steel. rather than any shortage of components.

Stocks must be bigger to do a bigger business, runs the adage. Purchasing agents seem to be anticipating a rousing first half with this scheduled inventory build-up.

Better than 90 per cent of the buyers surveyed consider deliveries generally adequate. That's a good way to start off 1957, and compares with the 80 per cent who felt that way a year ago.

Danger Line—Respondents may be anticipating higher prices for components, too. Any scramble for stocks will, however, only contribute to inflation and further shortages.

Coming after a period of stock cutting that has lasted since the end of the steel strike, this build-up doesn't contain too much danger unless it extends into the second quarter. After that, watch out.

Economists are pretty certain that the first half of 1957 holds little to fear for business, but some are telling us to be prepared for a slowdown in the second half. Buyers who overstock now will pay for it eventually. Inventories these days run a little like the government's tight money policy. They have to be held close to the chest to avoid throwing a supplier or customer into a tizzy if they become unbalanced.

Ferroalloys . . .

Ferroalloy Prices, Page 504

Production and consumption of ferroalloys and metals this year about equaled 1955 totals, says A. L. Foscue, president, Electro Metallurgical Co., in a year-end review. Based on present and projected requirements, he thinks production and use may hit an all-time high next year.

Chromium production equaled that in 1955, the record year. Production of manganese and silicon was somewhat below 1955 volume.

Increased use of stainless steel for appliances and other consumer goods, aircraft, trains, trucks, transportation equipment, architectural applications, food processing and chemical equipment, offset decreased automotive use during the year. Production of chrome-nickel-manganese stainless, the 200 series, approached 20,000 ingot tons in the year, against 2000 in 1955. This steep uptrend is expected to continue in 1957. The 1960 production goal is 150,000 tons.

Titanium sponge production is estimated at 13,000 tons, against 7200 in 1955 and a mere 3 tons in 1948. During 1956, sodium-reduced titanium sponge from Electromet's plant at Ashtabula, O., made its appearance in carload lots.

To keep pace with demand, titanium sponge production should approach 30,000 tons annually by the end of 1957, according to Mr. Foscue. Also, he says, continued growth of other high temperature alloys can be expected in 1957 in such applications as gas turbines and jet engines, as well as special alloys and metals for atomic energy needs and electronic applications.

Demand is expected to be higher for chromium, cobalt, columbium, molybdenum, nickel, silicon, tantalum, tungsten, vanadium, zirconium and other less common metals.

Iron Ore . . .

Iron Ore Prices, Page 505

Stocks of iron ore at docks and furnaces at the end of October totaled 60,749,072 gross tons, reports the Lake Superior Iron Ore Association. This included 47,482,788 tons of Lake Superior ores, 2,796,461 tons of other U.S. ores, 5,656,638 tons of other Canadian ores and 4,813,187 tons of foreign ores.

Consumption during October totaled 12,011,111 tons, of which 7,212,816 tons were U.S. Lake Superior ores, 1,787,445 tons, other U.S. ores, 342,821 tons, Canadian Lake Superior ores, 928,945 tons, other U.S. ores, 1,739,084 tons, foreign ores.

In the first ten months of this year, consumption was 101,826,911 tons, of which 64,680,932 tons were U.S. Lake Superior ore; 15,283,513 tons, other U.S. ores; 2,884,156 tons, Canadian Lake Superior ores; 6,092,414, other Canadian ores; and 12,885,896 tons, foreign ores.

There were 262 blast furnaces operating on the last day of October (243 in this country and 13 in Canada). There were only ten idle stacks.

The lease on the Godfrey underground mine near Chisholm, Minn., has been assigned to the Snyder Mining Co. by the Oliver Iron Mining Division, U.S. Steel Corp., R. T. Elstad, Oliver president, and W. P. Snyder Jr., Snyder president, announced recently. Snyder Mining, owned by the Shenango Furnace Co. and Crucible Steel Co. of America, will operate the mine in conjunction with their own adjacent South Tener mine.

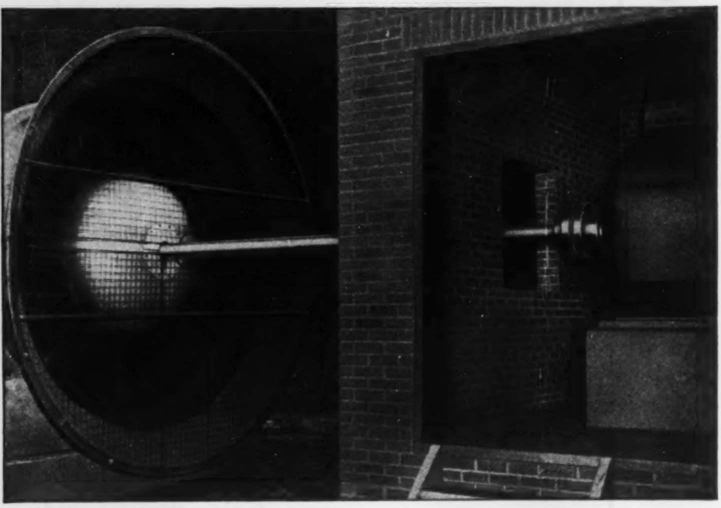
Owned by the W. R. Burt Estate, Saginaw, Mich., the Godfrey mine shipped its first ore in 1927. It produced 11,500,000 tons before it shut down in March, 1955. It will be reopened soon.

Canada . . .

Production of pig iron in Canada during October amounted to 307,630 net tons. This compares with 295,824 in September, and 293,423 in October, 1955. During the first ten months, output was 2,955,506 net tons, against 2,647,876 in the like period of last year.

Production of steel ingots and

Eliminate Intermediate Bearings!



By using Thomas Flexible Couplings on long, unsupported shafts, intermediate bearings are eliminated. Thomas engineers tubular shafts free from lateral whip.

The large fan shown above is 16′ from the motor to allow sufficient air intake. Miners working underground receive their fresh air supply from this fan and others like it, which have been giving dependable service for as long as fifteen years . . . without shutdowns for lubrication or maintenance of the couplings.

Thomas floating shaft flexible couplings are recommended for machine and marine drives, printing presses, paper and cement mills, cooling towers, diesel engines, pumps, compressors, and many other uses.

Only Thomas Flexible Couplings offer *all* these advantages
UNDER LOAD and MISALIGNMENT

1. Freedom from Backlash—Torsional Rigidity
2. Free End Float
3. Smooth Continuous Drive with Constant Rotational Velocity
4. Visual Inspection in Operation
5. Original Balance for Life

. . . *and*

THOMAS ALL METAL COUPLINGS HAVE NO WEARING PARTS
SO LUBRICATION AND MAINTENANCE ARE ELIMINATED

Write for Engineering Catalog 51A

THOMAS FLEXIBLE COUPLING COMPANY
WARREN, PENNSYLVANIA, U.S.A.

castings in October totaled 466,176 net tons, compared with 434,373 in September, and 417,266 in October, 1955. In the first ten months, production totaled 4,411,233 net tons, compared with 3,690,797 in the like 1955 period.

The Japanese steel industry has contracted for 1,500,000 tons of iron ore from Canadian producers on Vancouver Island and Texada Island, British Columbia. Delivery of the ore is to be over a three-year period.

Blooming mill workers at the Hamilton plant of the Steel Co. of Canada set an all-time record for the Canadian steel industry when they rolled their 2 millionth ton of steel since the first of the year.

Stainless Steel . . .

Stainless Steel Prices, Page 500

Strong demand from heavy equipment producers is expected to keep stainless steel production strong in 1957. Sales of plate and hot-rolled bars are good, while demand for cold-rolled stainless strip, used by automakers, has lagged. Expectations are auto demands will increase in the first quarter.

Steel Bars . . .

Bar Prices, Page 493

Bar shipments (hot-rolled; cold-rolled; reinforcing; tool steel) averaged 1,083,742 net tons monthly in 1956, based on official figures for the first 10 months of the year (latest available data). This was equal to 15.8 per cent of the total steel product shipments from the mills during the year. It compares with a monthly average of 1,079,616 tons, or 15.3 per cent, in all of 1955.

Hot-rolled carbon bar supply is in balance with demand, but suppliers of alloy bars to the farm equipment industry, and sellers of cold-drawn bars to the auto builders, complain of poor sales.

Automotive volume is below mill expectations for January. Warehouse sales to small fabricators dropped in December, due to the holidays, and demand has not yet returned to normal.

Adding to worries of bar buyers is the possibility of higher prices.

New freight rates on carbon bars will up delivered prices.

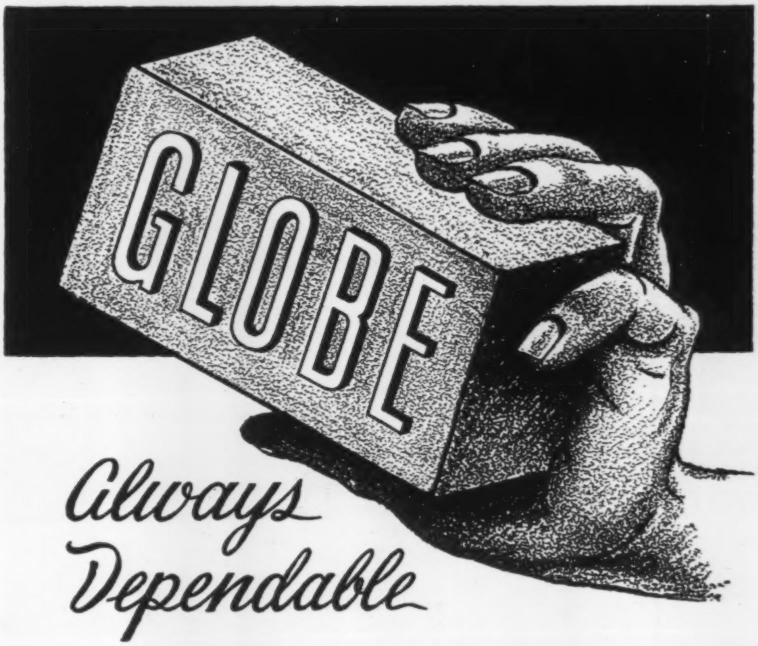
Sheets, Strip . . .

Sheet & Strip Prices, Pages 494 & 496

Sheet and strip steel shipments (hot-rolled; cold-rolled; galvanized; other coated; enameling; electrical) averaged 2,431,203 net tons monthly in 1956, based on official data for the first 10 months of the year (latest available). This was equal to 35.4 per cent of total finished steel shipments during the year. It compares with a monthly average of 2,696,087 tons, or 38.2 per cent, in 1955.

Predictions of a much sharper demand for sheets during first quarter are being made by producers. Major consumers already are stepping up their order volume, including cold-rolled tonnage from the auto builders. Manufacturers of household appliances are expected to show more interest in their requirements late in the quarter.

New extras on sheets, and higher freight rates will up delivered costs of sheets to consumers. In New England, for example, it is fig-



SUPERIOR LADLE BRICK

The greater heat resistance of GLOBE brick is well known in the steel industry. Because these bricks, wire cut or dry pressed, last longer—saving much time lost in refractory replacement—they help increase melting capacity. There is a type for every need, so let us place our experience at your disposal.

Lowers Per Ton Cost and
Increases Melting Capacity

SERVING THE STEEL INDUSTRY SINCE 1873

The GLOBE BRICK Co.
EAST LIVERPOOL, OHIO

ured costs will be $6 to $7 a ton higher on the basis of established buying patterns. Most producers are equalizing prices with the nearest mill to point of delivery.

Prices Reflect Freight Hike

United States Steel Export Co., New York, advanced prices on a number of steel products with freight included to New York, Philadelphia, and Baltimore.

These prices become effective concurrently with and reflect the higher carload freight rates applicable on railroad shipments to North Atlantic seaboard ports.

Bethlehem Builds at Seattle

Bethlehem Pacific Coast Steel Corp. plans a $25 million expansion which will increase steelmaking capacity at its Seattle plant by about 70 per cent. Capacity will be raised to 420,000 tons of ingots annually from 246,000 tons. Work already is under way on a building to house two 100-ton capacity electric furnaces. These will replace five present open hearths. Expansion of rolling facilities also is scheduled.

Steel Capacity up Sharply

Steelmaking capacity of the U.S. has attained the record mark of 133,459,150 net tons annually, reports Benjamin F. Fairless, president, American Iron & Steel Institute. This represents an increase of 5,096,060 tons over capacity as of Jan. 1, 1956.

Capacity has increased every year for 10 years in succession, and is now 45 per cent greater than at the end of World War II. During this interval potential output has been increased 42 million tons.

It is estimated more than $8 billion has been spent by the industry for new equipment and construction since the end of World War II. Inflation since prewar days has multiplied construction and new equipment costs.

Expansion in steel will continue in 1957 and future years, says Mr. Fairless. One year ago the steel companies announced programs for 1956, 1957 and 1958 totaling about 15 million ingot tons additional.

When welded aluminum must meet exacting standards...severe service

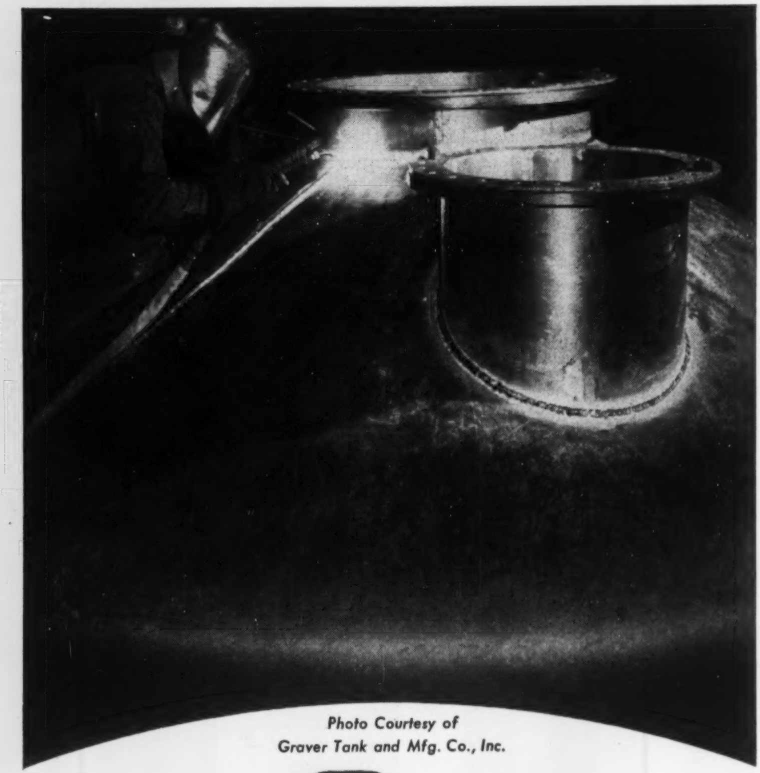


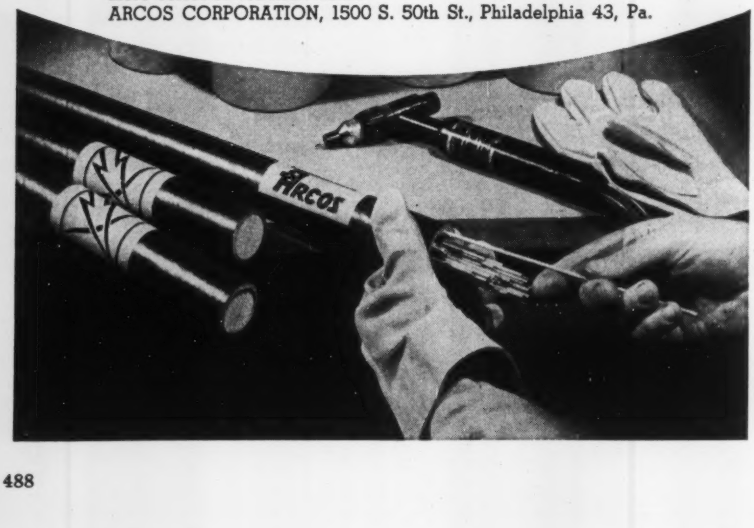
Photo Courtesy of Graver Tank and Mfg. Co., Inc.

WELD WITH ARCOS

ALUMINUM RODS and ELECTRODES

The inert-gas-shielded-arc process made aluminum welding practical . . . but it takes Arcos quality in aluminum bare wire to assure you the most dependable results possible. Because no flux is used, the chemical analysis and cleanliness of the wire must be within exacting limits. Arcos' long experience with weld metallurgy, plus rigid controls in manufacturing, guarantee this vital factor. Arcos aluminum wire is your best assurance of stronger, more ductile, more corrosion-resistant welds.

ARCOS CORPORATION, 1500 S. 50th St., Philadelphia 43, Pa.



To support the rise in steelmaking capacity, other facilities have been expanded. Blast furnace capacity went up 1,332,720 net tons last year and on Jan. 1, 1957, was rated at 86,817,950 net tons annually. Coke oven capacity is now rated at 72,970,980 net tons, up 1,462,580 tons over 1956. Finishing mill facilities have been expanded and improved, and much work has been done to increase raw material supplies.

Plates . . .

Plate Prices, Page 493

Shipments of plates averaged 633,280 tons monthly in 1956, based on data for the first 10 months of the year. The movement was equal to 9.2 per cent of total steel mill shipments. In 1955 plate tonnage averaged 563,521 tons monthly, 8.5 per cent of all mill tonnage that year.

While disappointing to shipbuilders, Washington's rejection of their request for priorities for steel plates for tankers clears the atmosphere with respect to special aid for so-called defense-support requirements, and will allow distribution to continue broadly along its present pattern.

Except for the recent increase of $7 per ton on carbon plates effected by Colorado Fuel & Iron Corp., prices are unchanged. The increase in freight will be reflected in higher delivered prices.

Tin Plate . . .

Tin Plate Prices, Page 496

Shipments of tin mill products (hot-dipped tin plate, electrolytic tin plate, black plate) averaged 547,378 net tons monthly in 1956, based on data for the first 10 months. This was equal to 8 per cent of total mill shipments of steel products of all classifications. It compares with 533,509 tons, 7.6 per cent, in 1955.

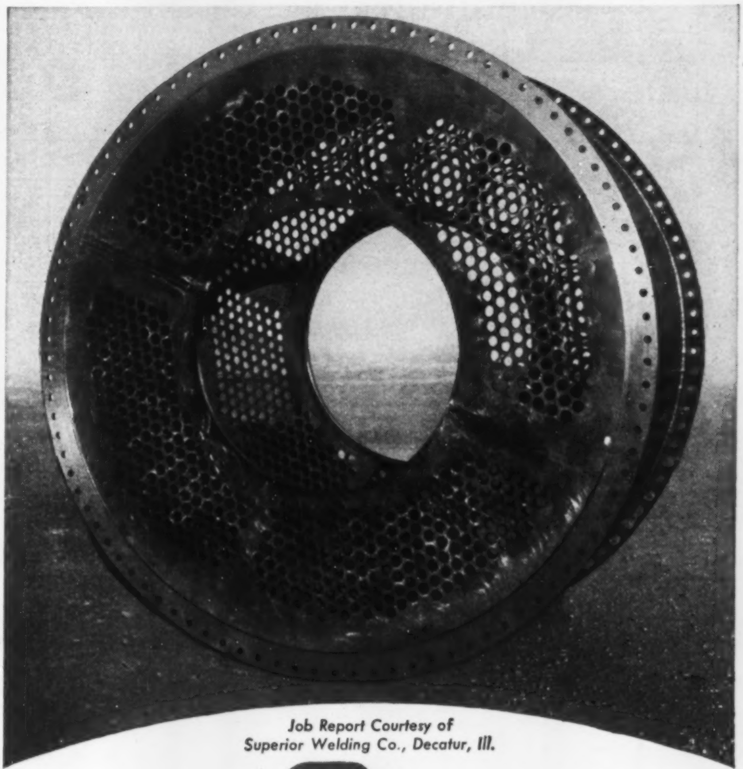
Warehouse . . .

Warehouse Prices, Page 502

Increased freight rates, effective as of Dec. 28, will result in a general revision in warehouse steel prices soon. Some changes have been posted in stainless steel prices.

Demand is picking up now that the holidays are over. Inventory

How to get trouble-free service from welded stainless equipment



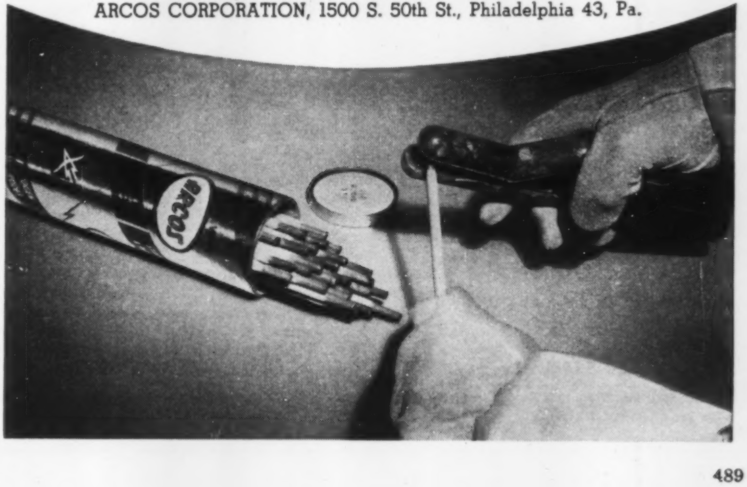
Job Report Courtesy of
Superior Welding Co., Decatur, Ill.

WELD WITH ARCOS

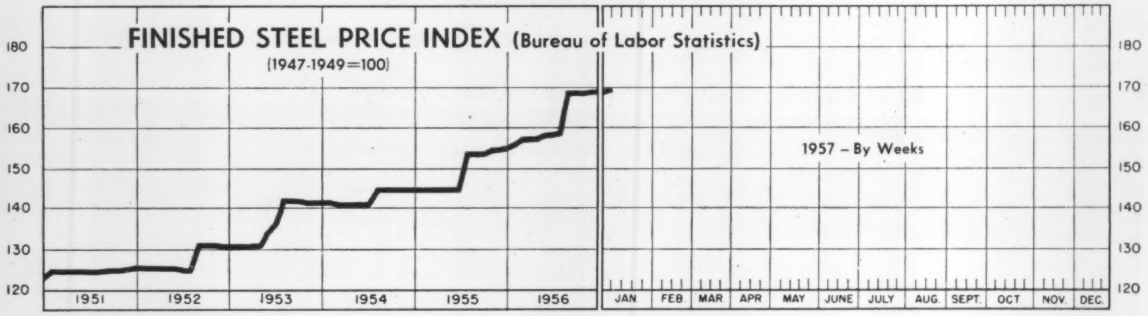
STAINLESS ELECTRODES

This heater or calandria section of a finish evaporator used in the food and chemical industries is made of Type 316 stainless plate. Equipment such as this must resist the corrosive attack of the acids in the liquids being processed. ARCOS Chromend KMo (Type 316) Electrodes were selected because of their known ability to produce sound weld metal that defies the destructive action of sulphuric, acetic, and similar organic acids. For trouble-free weld metal—easily deposited—use ARCOS Electrodes.

ARCOS CORPORATION, 1500 S. 50th St., Philadelphia 43, Pa.



Price Indexes and Composites



Jan. 1, 1957	Week Ago	Month Ago	Dec. Avg.	Year Ago
169.8†	**169.8**	**168.8**	**168.8**	**155.6**

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†Preliminary

AVERAGE PRICES OF STEEL (Bureau of Labor Statistics)

Week Ended Jan. 1

Prices include mill base prices and typical extras and deductions. Units are 100 lb except where otherwise noted in parentheses. For complete description of the following products and extras and deductions applicable to them, write to STEEL.

Rails, Standard, No. 1	$5.150	Bars, Reinforcing	5.738
Rails, Light, 40 lb	6.567	Bars, C.F., Carbon	9.610
Tie Plates	6.025	Bars, C.F., Alloy	13.275
Axles, Railway	9.083	Bars, C.F., Stainless, 302 (lb)	0.520
Wheels, Freight Car, 33 in. (per wheel)	57.50	Sheets, H.R. Carbon	5.905
Plates, Carbon	5.550	Sheets, C.R., Carbon	6.789
Structural Shapes	5.267	Sheets, Galvanized	8.220
Bars, Tool Steel, Carbon (lb)	0.480	Sheets, C.R., Stainless, 302 (lb)	0.652
Bars, Tool Steel Alloy, Oil Hardening Die (lb)	0.585	Sheets, Electrical	11.225
		Strip, C.R., Carbon	8.843
		Strip, C.R., Stainless, 403 (lb)	0.475
Bars, Tool Steel, H.R., Alloy, High Speed, W 6.75, Cr 4.5, V 2.1, Mo 5.5, C 0.60 (lb)	1.274	Strip, H.R., Carbon	5.925
		Pipe, Black, Buttweld (100 ft)	18.376
Bars, Tool Steel, H.R., Alloy, High Speed, W18, Cr 4, V 1 (lb)	1.769	Pipe, Galv., Buttweld (100 ft)	22.516
		Pipe, Line (100 ft)	182.860
Bars, H.R., Alloy	10.025	Casing, Oil Well, Carbon (100 ft)	178.046
Bars, H.R., Stainless, 303 (lb)	0.495	Casing, Oil Well, Alloy (100 ft)	276.870
Bars, H.R., Carbon	5.925		

Tubes, Boiler (100 ft)	45.033	Black Plate, Canmaking Quality	7.233
Tubing, Mechanical, Carbon (100 ft)	22.973	Wire, Drawn, Carbon	9.175
Tubing, Mechanical, Stainless, 304 (100 ft)	187.133	Wire, Drawn, Stainless, 430 (lb)	0.630
		Bale Ties (bundle)	7.213
Tin Plate, Hot-dipped, 1.25 lb	9.433	Nails, Wire, 8d Common	9.365
		Wire, Barbed (80-rod spool)	8.412
Tin Plate, Electrolytic, 0.25 lb	8.133	Woven Wire Fence (20-rod roll)	20.505

STEEL's FINISHED STEEL PRICE INDEX*

	Jan. 2 1957	Week Ago	Month Ago	Year Ago	5 Yrs. Ago
Index (1935-39 av.=100)	225.92	225.92	225.92	208.90	171.92
Index in cents per lb	6.111	6.111	6.111	5.659	4.657

STEEL's ARITHMETICAL PRICE COMPOSITES

Finished Steel NT*	$137.98	$137.98	$137.66	$127.68	$106.32
No. 2 Fdry Pig Iron, GT	62.63	62.63	62.63	58.99	52.54
Basic Pig Iron, GT	62.18	62.18	62.18	58.49	52.16
Malleable Pig Iron, GT	63.41	63.41	63.41	59.77	53.27
Steelmaking Scrap, GT	63.17	64.50	66.17	52.17	43.00

*For explanation of weighted index see STEEL, Sept. 19, 1949, p. 54; of arithmetical price composite, STEEL, Sept. 1, 1952, p. 130.

Comparison of Prices

Comparative prices by districts, in cents per pound except as otherwise noted. Delivered prices based on nearest production point.

FINISHED STEEL	Jan. 2 1957	Week Ago	Month Ago	Year Ago	5 Yrs. Ago
Bars, H.R., Pittsburgh	5.075	5.075	5.075	4.65	3.70
Bars, H.R., Chicago	5.075	5.075	5.075	4.65	3.70
Bars, H.R., deld, Philadelphia	5.365	5.35	5.35	4.90	4.223
Bars, C.F., Pittsburgh	6.85*	6.85*	6.85*	5.90	4.55
Shapes, Std., Pittsburgh	5.00	5.00	5.00	4.60	3.65
Shapes, Std., Chicago	5.00	5.00	5.00	4.60	3.65
Shapes, deld., Philadelphia	5.31	5.29	5.29	4.88	3.918
Plates, Pittsburgh	4.85	4.85	4.85	4.50	3.70
Plates, Chicago	4.85	4.85	4.85	4.50	3.70
Plates, Coatesville, Pa.	5.25	5.25	5.25	4.80	4.15
Plates, Sparrows Point, Md.	4.85	4.85	4.85	4.50	3.70
Plates, Claymont, Del.	5.70	5.70	5.35	4.80	4.15
Sheets, H.R., Pittsburgh	4.675	4.675	4.675	4.325	3.60-3.75
Sheets, H.R., Chicago	4.675	4.675	4.675	4.325	3.60
Sheets, C.R., Pittsburgh	5.75	5.75	5.75	5.325	4.35
Sheets, C.R., Chicago	5.75	5.75	5.75	5.325	4.35
Sheets, C.R., Detroit	5.75-5.85	5.75-5.85	5.75-5.85	5.325-5.425	4.55
Sheets, Galv., Pittsburgh	6.30	6.30	6.30	5.85	4.80
Strip, H.R., Pittsburgh	4.675	4.675	4.675	4.325	3.75-4.00
Strip, H.R., Chicago	4.675	4.675	4.675	4.325	3.50
Strip, C.R., Pittsburgh	6.85	6.85	6.85	6.25	4.65-5.35
Strip, C.R., Chicago	6.85	6.85	6.85	6.25-6.35	4.90
Strip, C.R., Detroit	6.95	6.95	6.95	6.35	4.85-5.60
Wire, Basic, Pittsburgh	7.20	7.20	7.20	6.25	4.85-5.10
Nails, Wire, Pittsburgh	8.20	8.20	8.20	7.60	5.90-6.20
Tin plate (1.50 lb), box, Pitts.	$9.95	$9.95	$9.95	$9.45	$8.70

*Including 0.35c for special quality

SEMIFINISHED STEEL					
Billets, forging, Pitts. (NT)	$91.50	$91.50	$91.50	$84.50	$66.00
Wire rods, $\frac{7}{32}$-$\frac{5}{8}$" Pitts.	5.80	5.80	5.80	5.025	4.10-4.30

PIG IRON, Gross Ton	Jan. 2 1957	Week Ago	Month Ago	Year Ago	5 Yrs. Ago
Bessemer, Pitts.	$63.50	$63.50	$63.50	$59.50	$53.00
Basic, Valley	62.50	62.50	62.50	58.50	52.00
Basic, deld. Phila.	66.38	66.26	66.26	62.16	56.61
No. 2 Fdry, NevilleIsland, Pa.	63.00	63.00	63.00	59.00	52.50
No. 2 Fdry, Chicago	63.00	63.00	63.00	59.00	52.50
No. 2 Fdry, deld. Phila.	66.88	66.76	66.76	62.66	57.11
No. 2 Fdry, Birm.	59.00	59.00	59.00	55.00	48.88
No. 2 Fdry (Birm.) deld. Cin.	66.70	66.70	66.70	62.70	55.49
Malleable, Valley	63.00	63.00	63.00	59.00	52.50
Malleable, Chicago	63.00	63.00	63.00	59.00	52.50
Ferromanganese, Duquesne.	235.00†	235.00†	235.00†	190.00†	188.00**

†74-76% Mn, net ton. *75-82% Mn, gross ton, Etna, Pa.

SCRAP, Gross Ton (Including broker's commission)					
No. 1 Heavy Melt, Pittsburgh	$62.50	$66.50	$66.50	$51.00	$44.00
No. 1 Heavy Melt, E. Pa.	63.00	63.00	63.00	55.00	42.50
No. 1 Heavy Melt, Chicago	64.00	64.00	69.00	49.50	42.50
No. 1 Heavy Melt, Valley	66.50	66.50	66.50	52.50	44.00
No. 1 Heavy Melt, Cleve.	63.50	65.00	65.00	51.50	43.00
No. 1 Heavy Melt, Buffalo	62.50	62.50	60.50	45.50	43.00
Rails, Rerolling, Chicago	89.50	89.50	93.50	71.00	52.50
No. 1 Cast, Chicago	50.50	50.50	50.50	50.50	49.00

COKE, Net Ton					
Beehive, Furn, Connlsvl.	$15.00	$15.00	$15.00	$14.125	$14.75
Beehive, Fdry, Connlsvl.	18.00	18.00	18.00	16.50	17.50

reductions effected in December brought stocks to a good workable level.

Tubular Goods . . .

Tubular Goods Prices, Page 500

Demand continues to mount for line pipe and oil country goods, but several tubular products are subject to decreases in buying. Sales of buttweld pipe are off seasonally.

Some mechanical tubemakers report receipt of emergency orders from auto builders who had underestimated their requirements. However, no substantial increase in mechanical tubing sales is noted.

Tubular goods shipments averaged 835,231 tons monthly in 1956. This was equal to 12.1 per cent of total steel product shipments during the year, and compares with 819,665 tons monthly, 11.6 per cent of the total movement, in all of 1955.

Wire . . .

Wire Prices, Pages 496 & 498

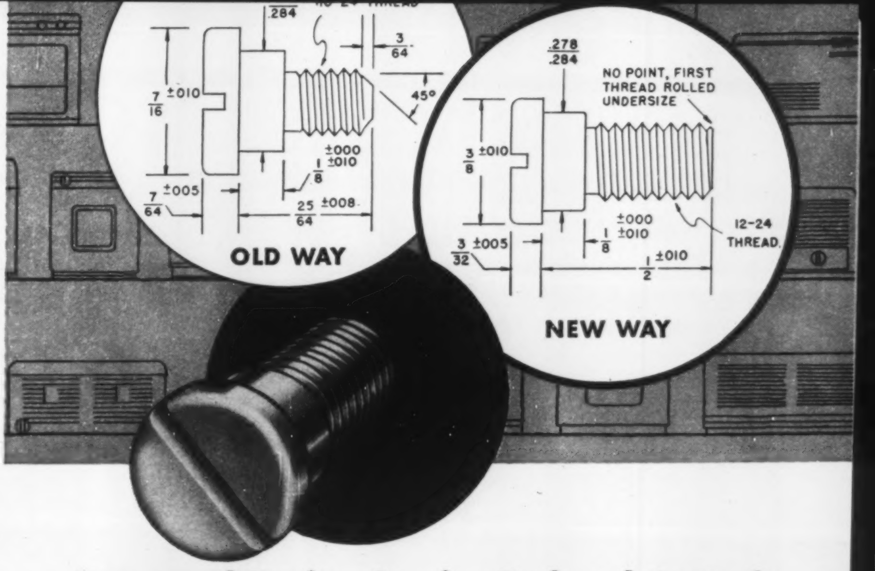
Nail business is being helped by a good volume of construction and favorable weather in the Midwest. Other merchant wire products, however, are not faring so well. Fencing business is at a virtual standstill.

Eastern wire mills are operating 15 to 20 per cent under the general steel production rate in the area. Bookings for first quarter are reported improving slightly, but slack buying through the October - December quarter, has thinned out backlogs.

Consumers of high carbon manufacturers and industrial grades have been operating largely off inventories. They are now entering orders in heavier volume. February sales will better those in January in both finished wire and rods.

Automotive buying continues hesitant, but is at a somewhat higher level than during the recent past.

Wire product shipments averaged 338,217 tons monthly in 1956, based on official data for the first 10 months of the year. This was equal to 4.9 per cent of the total steel movement. It compares with 360,796 tons, 5.1 per cent of total shipments, in 1955.



Townsend Design Service Reduced Cost of This Part from $10 to $5 per Thousand

The two parts shown above demonstrate how Townsend engineers saved an appliance manufacturer $5.00 per thousand by redesigning a special fastener so that it could be produced by cold-forming. By redesigning this part a costly machining operation was eliminated.

The shouldered screw at left, above, an integral part of a major appliance, was originally produced by another method at a cost of about $10.00 per thousand. Townsend engineers applied their extensive knowledge of cold-forming techniques to the problem and by slightly changing the design found that the part could be produced for about $5.00 per thousand—a clear savings of 50% on a part used in great volume. The new part shown at right provides just as efficient a fastener as the old.

This is a typical example of how the Townsend Technical Sales Department can help you in your efforts to improve your products and reduce assembly costs. These men can serve you in several ways—they will act as fastening consultants to your design and production engineers—they will design special parts or recommend the best standard fasteners. They often study an entire assembly procedure and suggest improved techniques.

The Technical Sales Department has back of it a company with nearly a century and a half of wire drawing and cold-forming experience. Townsend regularly produces more than 10,000 standard and special parts and fasteners—has the capacity to manufacture more than 60-million pieces a day.

To learn how you may use Townsend services to effect substantial savings in material costs, speed production and improve your products, write today for illustrated bulletins or use the coupon below.

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Lewis engineers have added three important improvements to their famous Travel-Cut Wire Straightening and Cutting Machines, 1. Wichita Air Clutch, 2. Wichita Air Brake, 3. Reeves Motodrive or similar variable speed drive, for SUPERIOR QUALITY CONTROL. Assures greater accuracy and produces quality rod with a minimum of spot swell. Lewis Machines are available in 34 models to handle from .012" to ¾" dia. at speeds up to 200 FPM.

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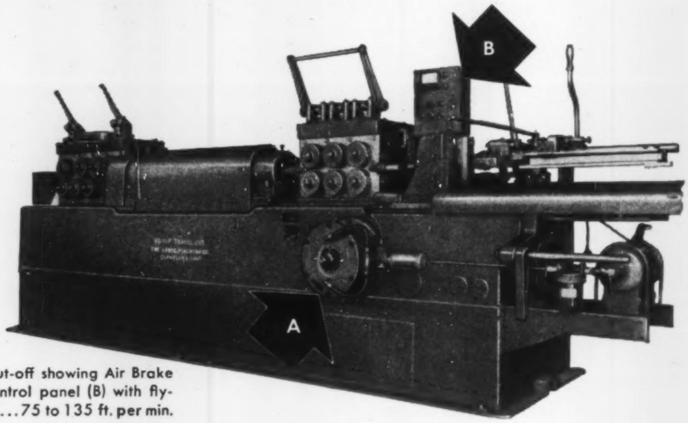

No. 11-F Travel-Cut with Flying Shear Cut-off showing Air Brake (A) (guard removed) and push-button control panel (B) with flywheel speed tachometer. Cap. ½" to ¾"...75 to 135 ft. per min.

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"C" Steel Castings—sand or shell molded—possess qualities far more interesting than the mere strength of steel. For, in addition to strength they provide more efficient design—better weight-strength ratio—and greater fatigue resistance, i.e., longer life and less replacement. Furthermore "C" Steel Castings, because they are truly foundry engineered from pattern to final casting, require minimum machining and provide better fit plus fast assembly.

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Crucible Steel Casting Co.

Lansdowne 2, Penna.

Steel Prices

Mill prices as reported to STEEL, cents per pound except as otherwise noted. *Changes shown in italics.* Code numbers following mill points indicate producing company. Key to producers, page 494; to footnotes, page 498.

SEMIFINISHED

INGOTS, Carbon, Forging (NT)

Munhall,Pa. U5	$70.50

INGOTS, Alloy (NT)

Detroit R7	$74.00
Houston S5	74.00
Midland,Pa. C18	74.00
Munhall,Pa. U5	74.00

BILLETS, BLOOMS & SLABS

Carbon, Rerolling (NT)

Aliquippa,Pa. J5	$74.00
Bessemer,Pa. U5	74.00
Bridgeport,Conn. N19	79.00
Buffalo R2	74.00
Clairton,Pa. U5	74.00
Ensley,Ala. T2	74.00
Fairfield,Ala. T2	74.00
Fontana,Calif. K1	83.50
Gary,Ind. U5	74.00
Johnstown,Pa. B2	74.00
Lackawanna,N.Y. B2	74.00
LoneStar,Tex. L6	80.00
Munhall,Pa. U5	74.00
Pittsburgh J5	74.00
S.Chicago,Ill. R2, U5	74.00
S.Duquesne,Pa. U5	74.00
Sterling,Ill. N15	74.00
Youngstown R2	74.00

Carbon, Forging (NT)

Aliquippa,Pa. J5	$91.50
Bessemer,Pa. U5	91.50
Bridgeport,Conn. N19	96.50
Buffalo R2	91.50
Canton,O. R2	94.00
Clairton,Pa. U5	91.50
Conshohocken,Pa. A3	96.50
Ensley,Ala. T2	91.50
Fairfield,Ala. T2	91.50
Fontana,Calif. K1	101.00
Gary,Ind. U5	91.50
Geneva,Utah C11	91.50
Houston S5	96.50
Johnstown, Pa. B2	91.50
Lackawanna,N.Y. B2	91.50
LosAngeles B3	101.00
Midland,Pa. C18	91.50
Munhall,Pa. U5	91.50
Pittsburgh J5	91.50
Seattle B3	105.00
S.Chicago R2, U5, W14	91.50
S.Duquesne,Pa. U5	91.50
S.SanFrancisco B3	101.00

Alloy, Forging (NT)

Bethlehem,Pa. B2	$107.00
Bridgeport,Conn. N19	107.00
Buffalo R2	107.00
Canton,O. R2	107.00
Conshohocken,Pa. A3	114.00
Detroit R7	107.00
Fontana,Calif. K1	128.00
Gary,Ind. U5	107.00
Houston S5	112.00
Ind.Harbor,Ind. Y1	107.00
Johnstown,Pa. B2	107.00
Lackawanna,N.Y. B2	107.00
LosAngeles B3	127.00
Massillon,O. R2	107.00
Midland,Pa. C18	107.00
Munhall,Pa. U5	107.00
S.Chicago R2,U5,W14	107.00
S.Duquesne,Pa. U5	107.00
Struthers,O. Y1	107.00
Warren,O. C17	107.00

ROUNDS, SEAMLESS TUBE (NT)

Bridgeport,Conn. N19	$116.50
Buffalo R2	111.50
Canton,O. R2	114.00
Cleveland,O. R2	111.50
Gary,Ind. U5	111.50
S.Chicago,Ill. R2,W14	111.50
S.Duquesne,Pa. U5	111.50

SKELP

Aliquippa,Pa. J5	4.725
LoneStar,Tex. L6	5.025
Munhall,Pa. U5	4.625
SparrowsPoint,Md. B2	4.625
Warren,O. R2	4.625
Youngstown R2, U5	4.625

WIRE RODS

AlabamaCity,Ala. R2	5.80
Alliquippa,Pa. J5	5.00
Alton,Ill. L1	6.00
Buffalo W12	5.80
Cleveland A7	5.80
Donora,Pa. A7	5.80
Fairfield,Ala. T2	5.80
Houston S5	6.05
IndianaHarbor,Ind. Y1	5.80
Johnstown,Pa. B2	5.80
Joliet,Ill. A7	5.80
KansasCity,Mo. S5	6.05
Kokomo,Ind. C16	5.90
LosAngeles B3	6.60
Minnequa,Colo. C10	6.05
Monessen,Pa. P7	5.80
N.Tonawanda,N.Y. B11	5.80
Pittsburg,Calif. C11	6.45
Portsmouth,O. P12	5.80
Roebling,N.J. R5	5.90
S.Chicago,Ill. R2	5.80
SparrowsPoint,Md. B2	5.90
Sterling,Ill.(1) N15	5.80
Sterling,Ill. N15	5.90
Struthers,O. Y1	5.80
Worcester,Mass. A7	6.10

STRUCTURALS

Carbon Steel Std. Shapes

Ala.City,Ala. R2	5.00
Aliquippa,Pa. J5	5.00
Bessemer,Ala. T2	5.00
Bethlehem,Pa. B2	5.05
Birmingham C15	5.30
Clairton,Pa. U5	5.00
Fairfield,Ala. T2	5.00
Fontana,Calif. K1	5.70
Gary,Ind. U5	5.00
Geneva,Utah C11	5.00
Houston S5	5.10
Ind.Harbor,Ind. I-2	5.00
Johnstown,Pa. B2	5.05
KansasCity,Mo. S5	5.10
Lackawanna,N.Y. B2	5.05
LosAngeles B3	5.70
Minnequa,Colo. C10	5.30
Munhall,Pa. U5	5.00
Niles,Calif. P1	5.75
Phoenixville,Pa. P4	5.85
Portland,Oreg. O4	5.80
Seattle B3	5.75
S.Chicago,Ill. U5, W14	5.00
S. SanFrancisco B3	5.65
Sterling,Ill. N15	5.00
Torrance,Calif. C11	5.70
Weirton,W.Va. W6	5.00

Wide Flange

Bethlehem,Pa. B2	5.05
Clairton,Pa. U5	5.00
Fontana,Calif. K1	5.85
IndianaHarbor,Ind. I-2	5.00
Lackawanna,N.Y. B2	5.05
Munhall,Pa. U5	5.00
Phoenixville,Pa. P4	5.85
S.Chicago,Ill. U5	5.00

Alloy Std. Shapes

Clairton,Pa. U5	6.20
Gary,Ind. U5	6.20
Houston S5	6.30
Munhall,Pa. U5	6.20
S.Chicago,Ill U5	6.20

H.S., L.A. Std. Shapes

Aliquippa,Pa. J5	7.35
Bessemer,Ala. T2	7.35
Bethlehem,Pa. B2	7.40
Clairton,Pa. U5	7.35
Fairfield,Ala. T2	7.35
Fontana,Calif. K1	8.05
Gary,Ind. U5	7.35
Geneva,Utah C11	7.35
Houston S5	7.45
Ind.Harbor,Ind. I-2,Y1	7.35
Johnstown,Pa. B2	7.40
KansasCity,Mo. S5	7.45
Lackawanna,N.Y. B2	7.40
LosAngeles B3	8.05
Munhall,Pa. U5	7.35
Seattle B3	8.10
S Chicago,Ill. U5, W14	7.35
S.SanFrancisco B3	8.00
Struthers,O. Y1	7.35

H.S., L.A. Wide Flange

Bethlehem,Pa. B2	7.40
Ind.Harbor,Ind. I-2	7.35
Lackawanna,N.Y. B2	7.40
Munhall,Pa. U5	7.35
S.Chicago,Ill. U5	7.35

PILING

BEARING PILES

Bethlehem,Pa. B2	5.05
Lackawanna,N.Y. B2	5.05
Munhall,Pa. U5	5.00
S.Chicago,Ill. U5	5.00

STEEL SHEET PILING

Ind.Harbor,Ind. I-2	5.90
Lackawanna,N.Y. B2	5.90
Munhall,Pa. U5	5.90
S.Chicago,Ill. U5	5.90

PLATES

PLATES, Carbon Steel

Ala.City,Ala. R2	4.85
Aliquippa,Pa. J5	4.85
Ashland,Ky. (15) A10	4.85
Bessemer,Ala. T2	4.85
Bridgeport,Conn. N19	4.75
Clairton,Pa. U5	4.85
Claymont,Del. C22	5.70
Cleveland J5, R2	4.95
Coatesville,Pa. L7	5.25
Conshohocken,Pa. A3	4.90
Detroit M1	4.95
Ecorse,Mich. G5	4.95
Fairfield,Ala. T2	4.85
Fontana,Calif.(30) K1	5.55
Gary,Ind. U5	4.85
Geneva,Utah C11	4.85
GraniteCity,Ill. G4	5.05
Harrisburg,Pa. P4	5.80
Houston S5	4.95
Ind.Harbor,Ind. I-2, Y1	4.85
Johnstown,Pa. B2	4.85
Lackawanna,N.Y. B2	4.85
LoneStar,Tex. L6	5.20
Minnequa,Colo. C10	5.70
Munhall,Pa. U5	4.85
Newport,Ky. N9	4.85
Pittsburgh J5	4.85
Riverdale,Ill. A1	4.85
Seattle B3	5.75
Sharon,Pa. S3	4.85
S.Chicago,Ill. U5, W14	4.85
SparrowsPoint,Md. B2	4.85
Steubenville,O. W10	4.85
Warren,O. R2	4.85
Weirton,W.Va. W6	4.85
Youngstown R2, U5, Y1	4.85

PLATES, Carbon Abras. Resist.

Claymont,Del. C22	6.20
Fontana,Calif. K1	6.70
Geneva, Utah C11	6.00
Jonhstown,Pa. B2	5.65
SparrowsPoint,Md. B2	5.65

PLATES, Wrought Iron

Economy,Pa. B14	11.128

PLATES, High-Strength Low-Alloy

Aliquippa,Pa. J5	7.25
Bessemer,Ala. T2	7.25
Clairton,Pa. U5	7.25
Claymont,Del. C22	7.55
Cleveland J5, R2	7.25
Coatesville,Pa. L7	7.55
Conshohocken,Pa. A3	7.25
Ecorse,Mich. G5	7.35
Fairfield,Ala. T2	7.25
Fontana,Calif.(30) K1	7.95
Gary,Ind. U5	7.25
Geneva,Utah C11	7.25
Houston S5	7.35
Ind.Harbor,Ind. I-2, Y1	7.25
Johnstown,Pa. B2	7.25
Munhall,Pa. U5	7.25
Pittsburgh J5	7.25
Seattle B3	8.15
Sharon,Pa. S3	7.25
S.Chicago,Ill. U5, W14	7.25
SparrowsPoint,Md. B2	7.25
Warren,O. R2	7.25
Youngstown U5, Y1	7.25

PLATES Alloy

Bridgeport,Conn. N19	6.55
Claymont,Del. C22	6.85
Coatesville,Pa. L7	6.85
Fontana,Calif.(30) K1	7.55
Gary,Ind. U5	6.85
Houston S5	6.95
Ind.Harbor,Ind. Y1	6.85
Johnstown,Pa. B2	6.85
Munhall,Pa. U5	6.85
Newport,Ky. N9	6.85
Seattle B3	7.75
Sharon,Pa. S3	6.85
S.Chicago,Ill. U5, W14	6.85
SparrowsPoint,Md. B2	6.85
Youngstown Y1	6.85

FLOOR PLATES

Cleveland J5	5.925
Conshohocken,Pa. A3	5.925
Harrisburg,Pa. P4	6.275
Ind.Harbor,Ind. I-2	5.925
Munhall,Pa. U5	5.925
S.Chicago,Ill. U5	5.925

PLATES, Ingot Iron

Ashland c.l. (15) A10	5.10
Ashland l.c.l. (15) A10	5.60
Cleveland c.l. R2	5.60
Warren,O. c.l. R2	5.60

BARS

BARS, Hot-Rolled Carbon (Merchant Quality)

Ala.City,Ala.(9) R2	5.075
Aliquippa,Pa.(9) J5	5.075
Alton,Ill. L1	5.275
Atlanta(9) A11	5.575
Bessemer,Ala. (9) T2	5.075
Birmingham(9) C15	5.375
Bridgeport,Conn. N19	5.30
Buffalo(9) R2	5.075
Clairton,Pa. U5	5.075
Cleveland(9) R2	5.075
Ecorse,Mich.(9) G5	5.175
Emeryville,Calif. J7	5.85
Fairfield,Ala.(9) T2	5.075
Fairless,Pa.(9) U5	5.225
Fontana,Calif.(9) K1	5.775
Gary,Ind.(9) U5	5.075
Geneva,Utah(9) C11	5.157
Houston(9) S5	5.325
Ind.Harbor(9) I-2, Y1	5.075
Johnstown,Pa.(9) B2	5.075
Joliet,Ill. P22	5.575
KansasCity,Mo.(9) S5	5.325
Lackawanna(9) B2	5.075
LosAngeles(9) B3	5.775
Milton,Pa.(23) M18	5.425
Minnequa,Colo. C10	5.525
Niles,Calif. P1	5.85
N.T'wanda,N.Y.(9)B11	5.075
Pittsburg,Calif.(9) C11	5.775
Pittsbugh(9) J5	5.075
Portland,Oreg. O4	5.85
Seattle B3, N14	5.825
S.Ch'c'go(9)R2,U5,W14	5.075
S.Duquesne,Pa.(9) U5	5.075
S.SanFran.,Calif.(9) B3	5.825
Sterling,Ill.(1) N15	5.075
Sterling,Ill. N15	5.175
Struthers,O. Y1	5.075
Torrance,Calif.(9) C11	5.775
Weirton,W.Va.(9)W6	5.075
Youngstown(9) R2, U5	5.075

BARS, H.R. Leaded Alloy (Including leaded extra)

Warren,O. C17	7.125

BARS, Hot-Rolled Alloy

Bethlehem,Pa. B2	6.125
Bridgeport,Conn. N19	6.20
Buffalo R2	6.125
Canton,O. R2	6.125
Clairton,Pa. U5	6.125
Detroit R7	6.125
Ecorse,Mich. G5	6.225
Fairless,Pa. U5	6.275
Fontana,Calif. K1	7.175
Gary,Ind. U5	6.125
Houston S5	6.375
Ind.Harbor,Ind. I-2,Y1	6.125
Johnstown,Pa. B2	6.125
KansasCity,Mo. S5	6.375
Lackawanna,N.Y. B2	6.125
LosAngeles B3	7.175
Massillon,O. R2	6.125
Midland,Pa. C18	6.125
S.Chicago R2,U5, W14	6.125
S.Duquesne,Pa. U5	6.125
Struthers,O. Y1	6.125
Warren,O. C17	6.125
Youngstown U5	6.125

BARS & SMALL SHAPES, H.R. High-Strength Low-Alloy

Aliquippa,Pa. J5	7.425
Bessemer,Ala. T2	7.425
Bethlehem,Pa. B2	7.425
Bridgeport,Conn. N19	7.50
Clairton,Pa. U5	7.425
Cleveland R2	7.425
Ecorse,Mich. G5	7.525
Fairfield,Ala T2	7.425
Fontana,Calif. K1	8.125
Gary,Ind. U5	7.425
Houston S5	7.675
Ind.Harbor,Ind. Y1	7.425
Johnstown,Pa. B2	7.425
KansasCity,Mo. S5	7.675
Lackawanna,N.Y. B2	7.425
LosAngeles B3	8.125
Pittsburgh J5	7.425
Seattle B3	8.175
S.Chicago,Ill. U5, W14	7.425
S.Duquesne,Pa. U5	7.425
S.SanFrancisco B3	8.175
Struthers,O. Y1	7.425
Youngstown U5	7.425

BAR SIZE ANGLES; H.R. Carbon

Bethlehem,Pa.(9) B2	5.225
Houston S5	5.325
KansasCity,Mo. S5	5.325
Lackawanna(9) B2	5.075
Sterling,Ill. N15	5.175
Sterling,Ill.(1) N15	5.075

BAR SIZE ANGLES; S. Shapes

Aliquippa,Pa. J5	5.075
Atlanta A11	5.575
Joliet,Ill P22	5.10
Niles,Calif. P1	5.85
Pittsburgh J5	5.075
Portland,Oreg. O4	5.85
SanFrancisco S7	5.95

BAR SHAPES, Hot-Rolled Alloy

Clairton,Pa. U5	6.20
Gary,Ind. U5	6.20
Houston S5	6.45
KansasCity,Mo. S5	6.45
Youngstown U5	6.20

BARS, C.F. Leaded Alloy (Including leaded extra)

Ambridge,Pa. W18	9.475
BeaverFalls,Pa. M12	9.475
Chicago W18	9.475
Cleveland C20	9.475
LosAngeles S30	11.10
LosAngeles P2	11.00
Monaca,Pa. S17	9.225
Newark,N.J. W18	9.65
Warren,O. C17	9.475

BARS, Cold-Finished Carbon

Ambridge,Pa. W18	6.85
BeaverFalls,Pa. M12,R2	6.85
Bridgeport,Conn. N19	7.20
Buffalo B5	6.90
Camden,N.J. P13	7.30
Carnegie,Pa. C12	6.85
Chicago W18	6.85
Cleveland A7, C20	6.85
Detroit B5, P17	7.05
Detroit R7	6.85
Donora,Pa. A7	6.85
Elyria,O. W8	6.85
FranklinPark,Ill. N5	6.85
Gary,Ind. U5	6.85
GreenBay,Wis. F7	6.85
Hammond,Ind. L2, M13	6.85
Hartford,Conn. R2	7.35
Harvey,Ill. B5	6.85
LosAngeles(49) S30	8.30
LosAngeles P2, R2	8.30
Mansfield,Mass. B5	7.40
Massillon,O. R2, R8	6.85
Midland,Pa. C18	6.85
Monaca,Pa. S17	6.85
Newark,N.J. W18	7.30
NewCastle,Pa.(17) B4	6.85
Pittsburgh J5	6.85
Plymouth,Mich. P5	7.10
Putnam,Conn. W18	7.40
Readville,Mass. C14	7.40
S.Chicago,Ill. W14	6.85
SpringCity,Pa. K3	7.30
Struthers,O. Y1	6.85
Waukegan,Ill. A7	6.85
Youngstown F3, Y1	6.85

BARS, Cold-Finished Carbon (Turned and Ground)

Cumberland,Md.(5) C19	6.10

BARS, Cold-Finished Alloy

Ambridge,Pa. W18	8.325
BeaverFalls,Pa.M12,R2	8.325
Bethlehem,Pa. B2	8.325
Bridgeport,Conn. N19	8.475
Buffalo B5	8.325
Camden,N.J. P13	8.50
Canton,O. T7	7.425
Carnegie,Pa. C12	8.325
Chicago W18	8.325
Cleveland A7, C20	8.325
Detroit B5, P17	8.525
Detroit R7	8.325
Donora,Pa. A7	8.325
Elyria,O. W8	8.325
FranklinPark,Ill. N5	8.325
Gary,Ind. R2	8.325
GreenBay,Wis. F7	8.325
Hammond,Ind. L2, M13	8.325
Hartford,Conn. R2	8.625
Harvey,Ill. B5	8.325
Lackawanna,N.Y. B2	8.325
LosAngeles P2, S30	10.10
Mansfield,Mass. B5	8.625
Massillon,O. R2, R8	8.325
Midland,Pa. C18	8.325
Monaca,Pa. S17	8.325
Newark,N.J. W18	8.50
Plymouth,Mich. P5	8.525
S.Chicago W14	8.325
SpringCity,Pa. K3	8.50
Struthers,O. Y1	8.325
Warren,O. C17	8.325
Waukegan,Ill. A7	8.325
Worcester,Mass. A7	8.625
Youngstown F3, Y1	8.325

BARS, Reinforcing (To Fabricators)

Ala.City,Ala. R2	5.075
Atlanta A11	5.575
Birmingham C15	5.375
Bridgeport,Conn. N19	5.30
Buffalo R2	5.075
Cleveland R2	5.075
Ecorse,Mich. G5	5.425
Emeryville,Calif. J7	5.85
Fairfield,Ala. T2	5.075
Fairless,Pa. U5	5.225

Ft.Worth,Tex.(42) T4	5.525
Gary,Ind. U5	5.075
Houston S5	5.325
Ind.Harbor,Ind. I-2, Y1	5.075
Johnstown,Pa. B2	5.075
Joliet,Ill. P22	5.575
KansasCity,Mo. S5	5.325
Lackawanna,N.Y. B2	5.075
LosAngeles B3	5.775
Milton,Pa. M18	5.225
Minnequa,Colo. C10	5.525
Niles,Calif. P1	5.85
Pittsburg,Calif. C11	5.775
Pittsburgh J5	5.075
Portland,Oreg. O4	5.85
SandSprings,Okla. S5	5.575
Seattle B3, N14	5.825
S.Chicago,Ill. R2	5.075
S.Duquesne,Pa. U5	5.075
S.SanFrancisco B3	5.825
SparrowsPoint,Md. B2	5.075
Sterling,Ill.(1) N15	5.075
Sterling,Ill. N15	5.175
Struthers,O. Y1	5.075
Torrance,Calif. C11	5.775
Youngstown R2, U5	5.075

BARS, Reinforcing (Fabricated; to Consumers)

Chicago U8	6.81
Cleveland U8	6.79
Johnstown,Pa. ¼-1" B2	6.73
KansasCity,Mo. S5	7.00
Marion,O. P11	6.70
New York U8	7.18
Pittsburgh U8	6.75
Seattle B3, N14	7.20
SparrowsPt. ½-1" B2	6.73
Williamsport,Pa. S19	6.65

RAIL STEEL BARS

ChicagoHts.(3) C2, I-2	5.075
ChicagoHts.(4) I-2	5.075
ChicagoHts.(4) C2	5.65
Ft.Worth,Tex.(26) T4	5.525
Franklin,Pa.(4) F5	5.60
Franklin,Pa.(3) F5	5.10
JerseyShore,Pa.(4) J8	5.00
Marion,O.(3) P11	5.15
Moline,Ill.(3) R2	5.225
Tonawanda(3) B12	5.65
Tonawanda(4) B12	6.15
Williamsport,Pa.(3) S19	5.65

BARS, Wrought Iron

Economy,Pa.(S.R.)B14	12.305
Economy,Pa.(D.R.)B14	15.301
Economy(Staybolt)B14	15.676
McK.Rks.(S.R.) L5	13.15
McK.Rks.(D.R.) L5	18.00
McK.Rks.(Staybolt)L5	19.50

SHEETS

SHEETS, Hot-Rolled Steel (18 Gage and Heavier)

Ala.City,Ala. R2	4.675
Allenport,Pa. P7	4.675
Ashland,Ky.(8) A10	4.675
Cleveland J5, R2	4.675
Conshohocken,Pa. A3	4.725
Detroit(8) M1	4.775
Dravosburg,Pa. U5	4.675
Ecorse,Mich. G5	4.775
Fairfield,Ala. T2	4.675
Fairless,Pa. U5	4.725
Fontana,Calif. K1	5.475
Gary,Ind. U5	4.675
Geneva,Utah C11	4.775
GraniteCity,Ill.(8) G4	4.875
Ind.Harbor,Ind. I-2, Y1	4.675
Lackawanna,N.Y. B2	4.675
Munhall,Pa. U5	4.675
Newport,Ky.(8) N9	4.675
Niles,O. M21	4.675
Pittsburg,Calif. C11	5.375
Pittsburgh J5	4.675
Portsmouth,O. P12	4.675
Riverdale,Ill. A1	4.675
Sharon,Pa. S3	4.675
S.Chicago,Ill. W14	4.675
SparrowsPoint,Md. B2	4.675
Steubenville,O. W10	4.675
Warren,O. R2	4.675
Weirton,W.Va. W6	4.675
Youngstown U5, Y1	4.675

SHEETS, H.R., (19 Ga. & Lighter)

Niles,O. M21	5.75

SHEETS, H.R. Alloy

Dravosburg,Pa. U5	7.75
Gary,Ind. U5	7.75
Ind.Harbor,Ind. Y1	7.75
Newport,Ky. N9	7.75
Youngstown Y1, U5	7.75

SHEETS, H.R.(14 Ga. & Heavier) High-Strength Low-Alloy

Cleveland J5, R2	6.90
Conshohocken,Pa. A3	6.95
Dravosburg,Pa. U5	6.90
Ecorse,Mich. G5	7.00
Fairfield,Ala. T2	6.90
Fairless,Pa. U5	6.95
Fontana,Calif. K1	7.70
Gary,Ind. U5	6.90
Ind.Harbor,Ind. I-2, Y1	6.90
Lackawanna(35) B2	6.90
Munhall,Pa. U5	6.90
Pittsburgh J5	6.90
S.Chicago,Ill. U5	6.90
SparrowsPoint(36) B2	6.90
Warren,O. R2	6.90
Weirton,W.Va. W6	6.90
Youngstown U5, Y1	6.90

SHEETS, Hot-Rolled Ingot Iron (18 Gage and Heavier)

Ashland,Ky.(8) A10	4.925
Cleveland R2	5.425
Ind.Harbor,Ind. I-2	4.925
Warren,O. R2	5.425

SHEETS, Cold-Rolled Steel (Commercial Quality)

Allenport,Pa. P7	5.75
Cleveland J5, R2	5.75
Conshohocken,Pa. A3	5.80
Detroit M1	5.75
Dravosburg,Pa. U5	5.75
Ecorse,Mich. G5	5.85
Fairfield,Ala. T2	5.75
Fairless,Pa. U5	5.80
Follansbee,W.Va. F4	5.75
Fontana,Calif. K1	6.95
Gary,Ind. U5	5.75
GraniteCity,Ill. G4	5.95
Ind.Harbor,Ind. I-2, Y1	5.75
Lackawanna,N.Y. B2	5.75
Mansfield,O. E6	5.75
Middletown,O. A10	5.75
Newport,Ky. N9	5.75
Pittsburg,Calif. C11	6.70
Pittsburgh J5	5.75
Portsmouth,O. P12	5.75
SparrowsPoint,Md. B2	5.75
Steubenville,O. W10	5.75
Warren,O. R2	5.75
Weirton,W.Va. W6	5.75
Yorkville,O. W10	5.75
Youngstown Y1	5.75

SHEETS, Cold-Rolled High-Strength, Low-Alloy

Cleveland J5, R2	8.525
Dravosburg,Pa. U5	8.525
Ecorse,Mich. G5	8.625
Fairless,Pa. U5	8.575
Fontana,Calif. K1	9.725
Gary,Ind. U5	8.525
IndianaHarbor,Ind. Y1	8.525
Lackawanna(37) B2	8.525
Pittsburgh J5	8.525
SparrowsPoint(38) B2	8.525
Warren,O. R2	8.525
Weirton,W.Va. W6	8.525
Youngstown Y1	8.525

SHEETS, Cold-Rolled Ingot Iron

Cleveland R2	6.50
Middletown,O. A10	6.25
Warren,O. R2	6.50

SHEETS, Culvert

	Cu Steel	Cu Fe
Ashland,Ky. A10	6.65	6.90
Canton,O. R2	6.65	7.15
Dravosburg U5	6.65	6.90
Fairfield T2	6.65	6.90
Gary,Ind. U5	6.65	6.90
GraniteCity,Ill.G4	6.85	...
Ind.Harbor I-2	6.65	6.90
Kokomo,Ind. C16	6.75	...
MartinsFry. W10	6.65	...
Pittsburgh J5	...	6.65
Pitts.,Calif. C11	7.40	...
SparrowsPt. B2	6.65	...

SHEETS, Culvert—Pure Iron

Dravosburg,Pa. U5	6.90
Gary,Ind. U5	6.90
Ind.Harbor,Ind. I-2	6.90
MartinsFry.,O. W10	6.90

SHEETS, Galvanized Steel Hot-Dipped

Ala.City,Ala. R2	6.30‡
Ashland,Ky. A10	6.30†
Canton,O. R2	6.30‡
Dover,O. R1	6.30†
Dravosburg,Pa. U5	6.30†
Fairfield,Ala. T2	6.30†
Gary,Ind. U5	6.30†
GraniteCity,Ill. G4	6.50*
Ind.Harbor,Ind. I-2	6.30†
Kokomo,Ind. C16	6.40‡
MartinsFerry,O. W10	6.30*
Middletown,O. A10	6.30†
Pittsburg, Calif. C11	7.05*
Pittsburgh J5	6.30†
SparrowsPt.,Md. B2	6.30†
Warren,O. R2	6.30†
Weirton,W.Va. W6	6.30*

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*Continuous and noncontinuous. †Continuous. ‡Noncontinuous.

SHEETS, Well Casing

Fontana,Calif. K1	6.975

SHEETS, Galvanized High-Strength Low-Alloy

Dravosburg,Pa. U5	9.275
SparrowsPoint(39) B2	9.275

SHEETS, Galvannealed Steel

Canton,O. R2	6.70
Dravosburg,Pa. U5	6.70
Kokomo,Ind. C16	7.00

SHEETS, Galvanized Ingot Iron (Hot-dipped Continuous)

Ashland,Ky. A10	6.55
Middletown,O. A10	6.55

SHEETS, Electrogalvanized

Cleveland(28) R2	7.125
Niles,O.(28) R2	7.125
Weirton,W.Va. W6	6.975

SHEETS, Aluminum Coated

Butler,Pa. A10 (type 1)	8.95
Butler,Pa. A10 (type 2)	9.05

SHEETS, Enameling Iron

Ashland,Ky. A10	6.325
Cleveland R2	6.325
Dravosburg,Pa. U5	6.325
Gary,Ind. U5	6.325
GraniteCity,Ill. G4	6.525
Ind.Harbor,Ind. I-2, Y1	6.325
Middletown,O. A10	6.325
Niles,O. M21	6.325
Youngstown Y1	6.325

BLUED STOCK, 29 Gage

Follansbee,W.Va. F4	8.35
Ind.Harbor,Ind. I-2	8.175
Yorkville,O. W10	8.175

SHEETS, Long Terne Steel (Commercial Quality)

BeechBottom,W.Va. W10	6.70
Gary,Ind. U5	6.70
Mansfield,O. E6	6.70
Middletown,O. A10	6.70
Niles,O. M21	6.70
Weirton,W.Va. W6	6.70

SHEETS, Long Terne, Ingot Iron

Middletown,O. A10	7.10

Key To Producers

A1	Acme Steel Co.
A3	Alan Wood Steel Co.
A4	Allegheny Ludlum Steel
A5	Alloy Metal Wire Div., H. K. Porter Co. Inc.
A6	American Shim Steel Co.
A7	American Steel & Wire Div., U.S. Steel Corp.
A8	Anchor Drawn Steel Co.
A9	Angell Nail & Chaplet
A10	Armco Steel Corp.
A11	Atlantic Steel Co.
B1	Babcock & Wilcox Co.
B2	Bethlehem Steel Co.
B3	Beth. Pac. Coast Steel
B4	Blair Strip Steel Co.
B5	Bliss & Laughlin Inc.
B8	Braeburn Alloy Steel
B9	Brainard Steel Div., Sharon Steel Corp.
B10	E. & G. Brooke, Wickwire Spencer Steel Div. Colo. Fuel & Iron
B11	Buffalo Bolt Co., Div., Buffalo-Eclipse Corp.
B12	Buffalo Steel Corp.
B14	A. M. Byers Co.
B15	J. Bishop & Co.
C1	Calstrip Steel Corp.
C2	Calumet Steel Div. Borg-Warner Corp.
C4	Carpenter Steel Co.
C7	Cleve. Cold Rolling Mills
C8	Cold Metal Products Co.
C9	Colonial Steel Co.
C10	Colorado Fuel & Iron
C11	Columbia-Geneva Steel
C12	Columbia Steel & Shaft.
C13	Columbia Tool Steel Co.
C14	Compressed Steel Shaft.
C15	Connors Steel Div. H. K. Porter Co. Inc.
C16	Continental Steel Corp.
C17	Copperweld Steel Co.
C18	Crucible Steel Co.
C19	Cumberland Steel Co.
C20	Cuyahoga Steel & Wire
C22	Claymont Steel Products Dept. Wickwire Spencer Steel Division
C23	Charter Wire Inc.
C24	G. O. Carlson Inc.
D2	Detroit Steel Corp.
D3	Dearborn Division Sharon Steel Corp.
D4	Disston & Sons, Henry
D6	Driver-Harris Co.
D7	Dickson Weatherproof Nail Co.
D8	Damascus Tube Co.
D9	Wilbur B. Driver Co.
E1	EasternGas&FuelAssoc.
E2	Eastern Stainless Steel
E4	Electro Metallurgical Co.
E5	Elliott Bros. Steel Co.
E6	Empire Steel Corp.
F2	Firth Sterling Inc.
F3	Fitzsimmons Steel Co.
F4	Follansbee Steel Corp.
F5	Franklin Steel Div. Borg-Warner Corp.
F6	Fretz-Moon Tube Co.
F7	Ft.Howard Steel & Wire
F8	Ft. Wayne Metals Inc.
G4	Granite City Steel Co.
G5	Great Lakes Steel Corp.
G6	Greer Steel Co.
H1	Hanna Furnace Corp.
H7	Helical Tube Co.
I-1	Igoe Bros. Inc.
I-2	Inland Steel Co.
I-3	Interlake Iron Corp.
I-4	Ingersoll Steel Div., Borg-Warner Corp.
I-6	Ivins, E., Steel Tube
I-7	Indiana Steel & Wire Co.
J1	Jackson Iron & Steel Co.
J3	Jessop Steel Co.
J4	Johnson Steel & Wire Co.
J5	Jones & Laughlin Steel
J6	Joslyn Mfg. & Supply
J7	Judson Steel Corp.
J8	Jersey Shore Steel Co.
K1	Kaiser Steel Corp.
K2	Keokuk Electro-Metals
K3	Keystone Drawn Steel
K4	Keystone Steel & Wire
K7	Kenmore Metals Corp.
L1	Laclede Steel Co.
L2	LaSalle Steel Co.
L3	Latrobe Steel Co.
L5	Lockhart Iron & Steel
L6	Lone Star Steel Co.
L7	Lukens Steel Co.
M1	McLouth Steel Corp.
M4	Mahoning Valley Steel
M6	Mercer Pipe Div., Sawhill Tubular Products
M8	Mid-States Steel & Wire
M12	Moltrup Steel Products
M13	Monarch Steel Div., Jones & Laughlin Steel Corp.
M14	McInnes Steel Co.
M16	Md. Fine&Special. Wire
M17	Metal Forming Corp.
M18	Milton Steel Division, Merritt-Chapman&Scott
M21	Mallory-Sharon Titanium Corp.
N1	National Standard Co.
N2	National Supply Co.
N3	National Tube Div., U.S. Steel Corp.
N5	Nelsen Steel & Wire Co.
N6	New England High Carbon Wire Co.
N8	Newman-Crosby Steel
N9	Newport Steel Corp.
N14	Northwest.SteelRoll.Mill
N15	Northwestern S.&W. Co.
N16	New Delphos Mfg. Co.
N19	Northeastern Steel Corp.
O3	Oliver Iron & Steel Corp.
O4	Oregon Steel Mills
P1	Pacific States Steel Corp.
P2	Pacific Tube Co.
P4	Phoenix Iron & Steel Co. Sub. of Barium Steel Corp.
P5	Pilgrim Drawn Steel
P6	Pittsburgh Coke&Chem.
P7	Pittsburgh Steel Co.
P11	Pollak Steel Co.
P12	Portsmouth Division, Detroit Steel Corp.
P13	Precision Drawn Steel
P14	Pitts. Screw & Bolt Co.
P15	Pittsburgh Metallurgical
P16	Page Steel & Wire Div., Amer. Chain & Cable
P17	Plymouth Steel Co.
P19	Pitts. Rolling Mills
P20	Prod. Steel Strip Corp.
P22	Phoenix Mfg. Co.
R1	Reeves Steel & Mfg. Co.
R2	Republic Steel Corp.
R3	Rhode Island Steel Corp.
R5	Roebling's Sons, John A.
R6	Rome Strip Steel Co.
R7	Rotary Electric Steel Co.
R8	Reliance Div.,EatonMfg.
R9	Rome Mfg. Co.
R10	Rodney Metals Inc.
S1	Seneca Wire & Mfg. Co.
S3	Sharon Steel Corp.
S4	Sharon Tube Co.
S5	Sheffield Steel Div. Armco Steel Corp.
S6	Shenango Furnace Co.
S7	Simmons Co.
S8	Simonds Saw & Steel Co.
S12	Spencer Wire Corp.
S13	Standard Forgings Corp.
S14	Standard Tube Co.
S15	Stanley Works
S17	Superior Drawn Steel Co.
S18	Superior Steel Corp.
S19	Sweet's Steel Co.
S20	Southern States Steel
S23	Superior Tube Co.
S25	Stainless Welded Prod.
S26	Specialty Wire Co. Inc.
S30	Sierra Drawn Steel Corp.
S40	Seneca Steel Service
T2	Tenn.Coal & Iron Div., U.S. Steel Corp.
T3	Tenn. Prod. & Chem.
T4	Texas Steel Co.
T5	Thomas Strip Division, Pittsburgh Steel Co.
T6	Thompson Wire Co.
T7	Timken Roller Bearing
T9	Tonawanda Iron Div., Am. Rad. & Stan. San.
T13	Tube Methods Inc.
T19	Techalloy Co. Inc.
U4	Universal-Cyclops Steel
U5	United States Steel Corp.
U6	U.S. Pipe & Foundry
U7	Ulbrich Stainless Steels
U8	U.S. Steel Supply Div., U.S. Steel Corp.
V2	Vanadium-Alloys Steel
V3	Vulcan Crucible Div., H. K. Porter Co., Inc.
W1	Wallace Barnes Co.
W2	Wallingford Steel Co.
W3	Washburn Wire Co.
W4	Washington Steel Corp.
W6	Weirton Steel Co.
W7	W.Va. Steel & Mfg. Co.
W8	Western Automatic Machine Screw Co.
W9	Wheatland Tube Co.
W10	Wheeling Steel Corp.
W12	Wickwire Spencer Steel Div., Colo. Fuel & Iron
W13	Wilson Steel & Wire Co.
W14	Wisconsin Steel Div., International Harvester
W15	Woodward Iron Co.
W18	Wyckoff Steel Co.
Y1	Youngstown Sheet&Tube

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STRIP, Hot-Rolled Carbon

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Atlanta A11	4.875
Bessemer,Ala. T2	4.675
Birmingham C15	4.975
Bridgeport,Conn. N19	4.625
Buffalo(27) R2	4.675
Conshohocken,Pa. A3	4.725
Detroit M1	4.775
Ecorse,Mich. G5	4.775
Fairfield,Ala. T2	4.675
Fontana,Calif. K1	5.475
Gary,Ind. U5	4.675
Houston S5	4.925
Ind.Harbor,Ind. I-2, Y1	4.675
Johnstown,Pa.(25) B2	4.675
KansasCity,Mo. S5	4.925
Lackaw'na,N.Y.(25) B2	4.675
LosAngeles(25) B3	5.425
Minnequa,Colo. C10	5.775
Pittsburg,Calif. C11	5.425
Riverdale,Ill. A1	4.675
SanFrancisco S7	5.95
Seattle(25) B3	5.675
Seattle N14	5.675
Sharon,Pa. S3	4.675
S.Chicago,Ill. W14	4.675
S.SanFrancisco(25) B3	5.425
SparrowsPoint,Md. B2	4.675
Sterling,Ill.(1) N15	4.675
Sterling,Ill. N15	4.775
Torrance,Calif. C11	5.425
Warren,O. R2	4.675
Weirton,W.Va. W6	4.675
Youngstown U5	4.675

STRIP, Hot-Rolled Alloy

Bridgeport,Conn. N19	7.50
Carnegie,Pa. S18	7.75
Dravosburg,Pa. U5	7.75
Gary,Ind. U5	7.75
Ind.Harbor,Ind. Y1	7.75
LosAngeles B3	8.95
Newport,Ky. N9	7.75
Sharon,Pa. S3	7.75
S.Chicago,Ill. W14	7.75
Youngstown U5, Y1	7.75

STRIP, Hot-Rolled High-Strength, Low-Alloy

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Conshohocken,Pa. A3	6.95
Ecorse,Mich. G5	7.05
Fairfield,Ala. T2	6.95
Gary,Ind. U5	6.95
Houston S5	7.20
Ind.Harbor,Ind. I-2, Y1	6.95
KansasCity,Mo. S5	7.20
Lackawanna,N.Y. B2	6.95
LosAngeles(25) B3	7.70
Seattle(25) B3	7.95
Sharon,Pa. S3	6.95
S.SanFrancisco(25) B3	7.70
SparrowsPoint,Md. B2	6.95
Warren,O R2	6.95
Weirton,W.Va. W6	6.95
Youngstown U5, Y1	6.95

STRIP, Hot-Rolled Ingot Iron

Ashland,Ky.(8) A10	4.925
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STRIP, Cold-Rolled Carbon

Anderson,Ind. G6	6.85
Baltimore T6	6.85
Boston T6	7.40
Buffalo S40	6.85
Cleveland A7, J5	6.85
Conshohocken,Pa. A3	6.90
Dearborn,Mich. D3	6.95
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Dover,O. G6	6.85
Ecorse,Mich. G5	6.95
Follansbee,W.Va. F4	6.85
Fontana,Calif. K1	8.60
FranklinPark,Ill. T6	6.95
Ind.Harbor,Ind. Y1	6.85
Indianapolis C8	7.00
LosAngeles C1	8.80
NewBedford,Mass. R10	7.30
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NewCastle,Pa. B4, E5	6.85
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Pawtucket,R.I. N8	7.40
Pittsburgh J5	6.85
Riverdale,Ill. A1	6.95
Rome,N.Y.(32) R6	6.85
Sharon,Pa. S3	6.85
Trenton,N.J.(31) R5	8.30
Wallingford,Conn. W2	7.30
Warren,O. R2, T5	6.85
Weirton,W.Va. W6	6.85
Worcester,Mass. A7	7.40
Youngstown C8, Y1	6.85

STRIP, Cold-Rolled Alloy

Boston T6	14.90
Carnegie,Pa. S18	14.55
Cleveland A7	14.55
Dover,O G6	14.55
FranklinPark,Ill. T6	14.55
Harrison,N.J. C18	14.55
Indianapolis C8	14.70
Pawtucket,R.I. N8	14.90
Sharon,Pa. S3	14.55
Worcester,Mass. A7	14.85
Youngstown C8	14.55

STRIP, Cold-Rolled High-Strength, Low-Alloy

Cleveland A7	10.00
Dearborn,Mich. D3	10.10
Dover,O. G6	10.10
Ecorse,Mich. G5	10.10
Ind.Harbor,Ind. Y1	10.20
Sharon,Pa. S3	10.00
Warren,O. R2	10.00
Weirton,W.Va. W6	10.20
Youngstown Y1	10.20

STRIP, Cold-Rolled Ingot Iron

Warren,O. R2	7.60

STRIP, Electrogalvanized

Cleveland A7	6.85*
Dover,O. G6	6.85*
Riverdale,Ill. A1	6.95*
Warren,O. B9, T5	6.85*
Worcester,Mass. A7	7.40*
Youngstown C8	6.85*

*Plus galvanizing extras.

STRIP, Galvanized (Continuous)

Sharon,Pa. S3	6.975

TIGHT COOPERAGE HOOP

Atlanta A11	5.40
Riverdale,Ill. A1	5.25
Sharon,Pa. S3	5.10
Youngstown U5	5.10

STRIP, Cold-Finished Spring Steel (Annealed)

STRIP, Cold-Finished Spring Steel (Annealed)	0.26-0.40C	0.41-0.60C	0.61-0.80C	0.81-1.05C	1.06-1.35C
Baltimore T6	8.50	10.10	12.30	15.30	18.25
Boston T6	8.50	10.10	12.30	15.30	18.25
Bristol,Conn. W1	...	...	12.30	15.30	18.25
Carnegie,Pa. S18	...	9.80	12.00	15.00	....
Cleveland A7	7.95	9.80	12.00	15.00	17.95
Cleveland C7	...	9.80	12.00	15.00	17.95
Dover,O. G6	7.95	9.80	12.00	15.00	17.95
Detroit D2	8.05	9.90	12.10	15.10	....
Dearborn,Mich. D3	8.05	9.20	12.10	....	....
FranklinPark,Ill. T6	8.05	9.80	12.00	15.00	17.95
Harrison,N.J. C18	...	...	12.30	15.30	18.25
Indianapolis C8	8.10	9.95	12.00	15.00	17.95
NewBritain,Conn.(10) S15	7.95	9.80	12.00	15.00	17.95
NewCastle,Pa. B4, E5	7.95	9.80	12.00	15.00	....
NewHaven,Conn. D2	8.40	10.10	12.30	15.30	....
NewKensington,Pa. A6	7.95	9.80	12.00	15.00	....
NewYork W3	...	10.10	12.30	15.30	18.25
Pawtucket,R.I. N8	8.50	10.10	12.30	15.30	18.25
Riverdale,Ill. A1	8.05	9.80	12.00	15.00	17.95
Rome,N.Y.(32) R6	7.95	9.80	12.00	15.00	17.95
Sharon,Pa. S3	7.95	9.80	12.00	15.00	17.95
Trenton,N.J. R5	...	10.10	12.30	15.30	18.25
Wallingford,Conn. W2	8.40	10.10	12.30	15.30	18.15
Warren,O. T5	7.95	9.80	12.00	15.00	17.95
Weirton,W.Va. W6	7.95	9.80	12.00	15.00	17.95
Worcester,Mass. A7, T6	8.50	10.10	12.30	15.30	18.25
Youngstown C8	7.95	9.80	12.00	15.00	17.95

Spring Steel (Tempered)			Up to 0.80C	0.81-1.05C	1.06-1.35C
Bristol,Conn. W1	...	...	16.80	20.65	....
Buffalo W12	...	...	16.80	....	....
FranklinPark,Ill. T6	...	...	17.15	21.00	25.35
Harrison,N.J. C18	...	...	16.80	20.65	25.00
NewYork W3	...	...	16.80	20.65	25.00
Palmer,Mass. W12	...	...	16.80	....	....
Trenton,N.J. R5	...	...	16.80	20.65	25.00
Worcester,Mass. A7, T6	...	...	16.80	20.65	25.00
Youngstown C8	...	...	17.15	21.00	25.35

SILICON STEEL

H.R. SHEETS (22 Ga., cut lengths)	Field	Armature	Electric	Motor	Dynamo
BeechBottom,W.Va. W10	...	...	11.00	12.05	13.05
Brackenridge,Pa. A4	...	...	11.00	12.50	13.05
Mansfield,O. E6	9.20	10.35	11.00	12.05	13.05
Newport,Ky. N9	9.20	10.35	11.00	12.05	13.05
Niles,O. M21	9.20	10.35	11.00	12.05	....
Vandergrift,Pa. U5	...	10.35	11.00	12.05	13.05
Warren,O. R2	9.20	10.35	11.00	12.05	....
Zanesville,O. A10	...	10.35	11.00	12.05	13.05
Zanesville,O. A10 (FP coils)	...	10.85	11.525	12.575	13.55
Zanesville,O. A10 (SP coils)	...	....	11.025	12.075	13.05

C.R. COILS & CUT LENGTHS, (22 Ga.)

Fully Processed (Semiprocessed ½c lower)	Field	Armature	Electric	Motor	Dynamo
Brackenridge,Pa. A4	...	....	11.525	12.575	13.55
GraniteCity,Ill. G4	9.40*	10.55*	11.225*	12.275*	....
IndianaHarbor,Ind. I-2	9.20†	10.35*	11.025*	12.075*	....
Mansfield,O. E6	9.70	10.85	11.525	12.575	13.55
Vandergrift,Pa. U5	9.20*	10.35*	11.025*	12.075*	13.05*
Vandergrift,Pa. U5	...	10.85†	11.525†	12.575†	13.55†
Warren,O. R2	9.20*	10.85	11.525	12.575	13.55

H.R. SHEETS (22 Ga., cut lengths)	Transformer Grades T-72	T-65	T-58	T-52
BeechBottom,W.Va. W10	14.05	14.60	15.10	16.15
Brackenridge,Pa. A4	14.05	....	....	....
Vandergrift,Pa. U5	14.05	14.60	15.10	16.15
Zanesville,O. A10	14.05	14.60	15.10	16.15

C.R. COILS & CUT LENGTHS (22 Ga.)	Grain Oriented T-100	T-90	T-80	T-73	T-66	T-72
Brackenridge,Pa. A4	....	16.90	18.50	19.00	19.50	14.05**
Butler,Pa. A10	....	....	18.50	19.00	19.50	....
Vandergrift,Pa. U5	15.90	16.90	18.50	19.00	19.50	14.55**
Warren,O. R2	....	....	....	....	....	14.55‡

*Semiprocessed. †Fully processed only. ‡Coils, annealed, semiprocessed ½c lower. **Cut lengths, ¾-cent lower.

TIN MILL PRODUCTS

TIN PLATE, Electrolytic (Base Box)	0.25 lb	0.50 lb	0.75 lb
Aliquippa,Pa. J5	$8.40	$8.65	$9.05
Dravosburg,Pa. U5	8.40	8.65	9.05
Fairfield,Ala. T2	8.50	8.75	9.15
Fairless,Pa. U5	8.50	8.75	9.15
Fontana,Calif. K1	9.15	9.40	9.80
Gary,Ind. U5	8.40	8.65	9.05
GraniteCity,Ill. G4	8.50	8.75	9.15
IndianaHarbor,Ind. I-2, Y1	8.40	8.65	9.05
Niles,O. R2	8.40	8.65	9.05
Pittsburg,Calif. C11	9.15	9.40	9.80
SparrowsPoint,Md. B2	8.50	8.75	9.15
Weirton,W.Va. W6	8.40	8.65	9.05
Yorkville,O. W10	8.40	8.65	9.05
ELECTROTIN (22-27 Gage; Dollars per 100 lb)			
Aliquippa,Pa. J5	7.425	....	....
Niles,O. R2	7.425	7.625	7.925

TINPLATE, American	1.25 lb	1.50 lb
Aliquippa,Pa. J5	$9.70	$9.95
Dravosburg,Pa. U5	9.70	9.95
Fairfield,Ala. T2	9.80	10.05
Fairless,Pa. U5	9.80	10.05
Fontana,Calif. K1	10.45	10.70
Gary,Ind. U5	9.70	9.95
Ind. Harbor Y1	9.70	9.95
Pitts.,Calif. C11	10.45	10.70
Sp.Pt.,Md. B2	9.80	10.05
Weirton,W.Va. W6	9.70	9.95
Yorkville,O. W10	9.70	9.95

BLACK PLATE (Base Box)

Aliquippa,Pa. J5	$7.50
Dravosburg,Pa. U5	7.50
Fairfield,Ala. T2	7.60
Fairless,Pa. U5	7.60
Fontana,Calif. K1	8.25
Gary,Ind. U5	7.50
GraniteCity,Ill. G4	7.60
Ind.Harbor,Ind. I-2, Y1	7.50
Niles,O. R2	7.50
Pittsburg,Calif. C11	8.25
SparrowsPoint,Md. B2	7.60
Weirton,W.Va. W6	7.50
Yorkville,O. W10	7.50

HOLLOWARE ENAMELING Black Plate (29 Gage)

Aliquippa,Pa. J5	$7.15
Dravosburg,Pa. U5	7.15
Gary,Ind. U5	7.15
GraniteCity,Ill. G4	7.25
Ind.Harbor,Ind. Y1	7.15
Yorkville,O. W10	7.15

MANUFACTURING TERNES (Special Coated; Base Box)

Dravosburg,Pa. U5	$9.20
Gary,Ind. U5	9.20

ROOFING SHORT TERNES (8 lb Coated; Base Box)

Gary,Ind. U5	$10.75

WIRE

WIRE, Manufacturers Bright, Low Carbon

AlabamaCity,Ala. R2	7.20
Aliquippa,Pa. J5	7.20
Alton,Ill. L1	7.40
Atlanta A11	7.40
Bartonville,Ill. K4	7.30
Buffalo W12	7.20
Chicago W13	7.20
Cleveland A7, C20	7.20
Crawfordsville,Ind. M8	7.30
Donora,Pa. A7	7.20
Duluth A7	7.20
Fairfield,Ala. T2	7.20
Fostoria,O.(24) S1	7.30
Houston S5	7.45
Jacksonville,Fla. M8	7.55
Johnstown,Pa. B2	7.20
Joliet,Ill. A7	7.20
KansasCity,Mo. S5	7.45
Kokomo,Ind. C16	7.30
LosAngeles B3	8.15
Minnequa,Colo. C10	7.45
Monessen,Pa. P7, P16	7.20
N.Tonawanda,N.Y. B11	7.20
Palmer,Mass. W12	7.50
Pittsburg,Calif. C11	8.15
Portsmouth,O. P12	7.20
Rankin,Pa. A7	7.20
S.Chicago,Ill. R2	7.20
S.SanFrancisco C10	8.15
SparrowsPoint,Md. B2	7.30
Sterling,Ill.(1) N15	7.20
Sterling,Ill. N15	7.30
Struthers,O. Y1	7.20
Waukegan,Ill. A7	7.20
Worcester,Mass. A7	7.50

WIRE, Gal'd ACSR for Cores

Bartonville,Ill. K4	11.75
Buffalo W12	11.75
Johnstown,Pa. B2	11.75
Minnequa,Colo. C10	11.875
Monessen,Pa. P16	11.75
Muncie,Ind. I-7	11.95
Palmer,Mass. W12	12.05
Pittsburg,Calif. C11	12.55
Portsmouth,O. P12	11.75
Roebling,N.J. R5	12.05
SparrowsPt.,Md. B2	11.85
Struthers,O. Y1	11.75

ROPE WIRE	(A)
Bartonville,Ill. K4	11.55
Buffalo W12	11.55
Fostoria,O. S1	11.55
Johnstown,Pa. B2	11.55
Monessen,Pa. P7, P16	11.55
Muncie,Ind. I-7	11.75
Palmer,Mass. W12	11.85
Portsmouth,O. P12	11.55
Roebling,N.J. R5	11.85
SparrowsPt.,Md. B2	11.65
Struthers,O. Y1	11.55
Worcester,Mass. J4	11.85

(A) Plow and Mild Plow; add 0.25c for Improved Plow

WIRE, Upholstery Spring

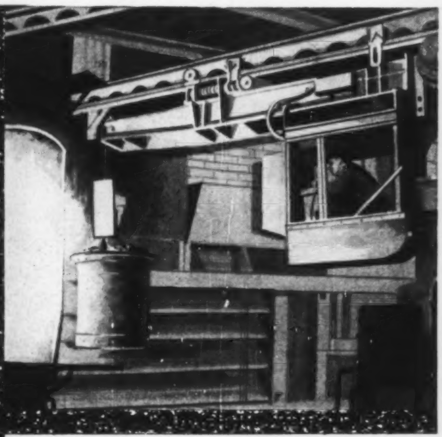
Aliquippa,Pa. J5	8.40
Alton,Ill. L1	8.60
Buffalo W12	8.40
Cleveland A7	8.40
Donora,Pa. A7	8.40
Duluth A7	8.40
Johnstown,Pa. B2	8.40
KansasCity,Mo. S5	8.65
LosAngeles B3	9.35
Minnequa,Colo. C10	8.60
Monessen,Pa. P7, P16	8.40
NewHaven,Conn. A7	8.70
Palmer,Mass. W12	8.70
Pittsburg,Calif. C11	9.35
Portsmouth,O. P12	8.40
Roebling,N.J. R5	8.70
S.Chicago,Ill. R2	8.40
S.SanFrancisco C10	9.35
SparrowsPoint,Md. B2	8.50
Struthers,O. Y1	8.40
Trenton,N.J. A7	8.70
Waukegan,Ill. A7	8.40
Worcester,Mass. A7	8.70

WIRE, MB Spring, High Carbon

Aliquippa,Pa. J5	8.725
Alton,Ill. L1	8.925
Bartonville,Ill. K4	8.825
Buffalo W12	8.725
Cleveland A7	8.725
Donora,Pa. A7	8.725
Duluth A7	8.725
Fostoria,O. S1	8.775
Johnstown,Pa. B2	8.725
LosAngeles B3	9.675
Milbury,Mass.(12) N6	9.025
Minnequa,Colo. C10	8.975
Monessen,Pa. P7, P16	8.725
Muncie,Ind. I-7	8.925
Palmer,Mass. W12	9.025
Pittsburg,Calif. C11	9.675
Portsmouth,O. P12	8.725
Roebling,N.J. R5	9.025
S.Chicago,Ill. R2	8.725
S.SanFrancisco C10	9.675
SparrowsPt.,Md. B2	8.825
Struthers,O. Y1	8.725
Trenton,N.J. A7	9.025
Waukegan,Ill. A7	8.725
Worcester A7, J4, T6	9.025

WIRE, Fine & Weaving (8" Coils)

Alton,Ill. L1	14.35
Bartonville,Ill. K4	14.25
Buffalo W12	14.15
Chicago W13	13.55
Cleveland A7	14.15
Crawfordsville,Ind. M8	14.25
Fostoria,O. S1	14.15
Jacksonville,Fla. M8	14.50
Johnstown,Pa. B2	14.15
Kokomo,Ind. C16	14.15
Minnequa,Colo. C10	13.90
Monessen,Pa. P6	14.15
Muncie,Ind. I-7	14.35
Palmer,Mass. W12	14.45
Roebling,N.J. C10	14.45
S.SanFrancisco C10	14.50
Waukegan,Ill. A7	14.15
Worcester,Mass. A7, T6	14.45



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3 to 5 WEEKS DELIVERY

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- The Vollrath Company offers you complete facilities for stainless steel castings of all types—with fast delivery!
- The Vollrath Company has complete contract manufacturing facilities for fabricating and finishing stainless steel and carbon steel products and parts, including vitreous enameling services.

Your inquiries are invited.

FOUNDRY DIVISION
THE VOLLRATH COMPANY
DEPT. S-I SHEBOYGAN, WISCONSIN

★ . . . for any information about bearings and bearing metals, consult with the A. W. Cadman Mfg. Co., master makers of fine bearing metals since 1860.

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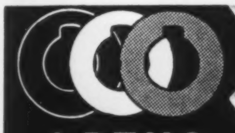

ARTUS PLASTIC SLITTING MACHINE SHIMS

COST JUST A FRACTION OF METAL SPACERS

THE COLOR TELLS THE THICKNESS

ALWAYS RETAINS UNIFORMITY AND EVENNESS UNDER ALL NORMAL CONDITIONS

Save Time! Save Money!

INDUSTRIAL PRODUCTS SUPPLIERS
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DYKEM STEEL BLUE®

Stops Losses making Dies and Templates

DYKEM STEEL BLUE
SPECIMEN
With DYKEM Steel Blue
Without DYKEM Steel Blue

Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample on company letterhead

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2303H North 11th St. • St. Louis 6, Mo.

Our large, planned stocks of **Punches & Dies** mean savings for you.

For years we have been following a systematic plan of increasing our stocks of standard punches and dies that benefits you two ways:

(1.) The punches and dies you need are *ready and waiting for you when you need them.*

(2.) Because standards are made in large quantities, *prices are surprisingly low*—quality of the highest.

68 years of experience goes into every Lewthwaite tool—and it shows!

CATALOG SHEETS ON REQUEST

T. H. LEWTHWAITE MACHINE CO., INC.
310 East 47th Street, New York 17, N. Y.

WIRE

WIRE, Tire Bead	
Bartonville,Ill. K4	15.25
Monessen,Pa. P16	14.45
Roeblnig,N.J. R5	15.60

WIRE, Cold-Rolled Flat	
Anderson,Ind. G6	10.75
Baltimore T6	11.05
Boston T6	11.05
Buffalo W12	10.75
Cleveland A7	10.75
Crawfordsville,Ind. M8	10.75
Dover,O. G6	10.75
Fostoria,O. S1	10.75
FranklinPark,Ill. T6	10.85
Kokomo,Ind. C16	10.75
Massillon,O. R8	10.75
Milwaukee C23	10.95
Monessen,Pa. P7, P16	10.75
NewKensington,Pa. A6	10.75
Palmer,Mass. W12	11.05
Pawtucket,R.I. N8	11.05
Riverdale,Ill. A1	10.85
Rome,N.Y. R6	10.75
Trenton,N.J. R5	11.05
Worcester,Mass. A7, T6	11.05

NAILS & POLISHED STAPLES, Stock	Col.
AlabamaCity, Ala. R2	164
Aliquippa,Pa. (7) J5	167
Atlanta A11	166
Bartonville,Ill. (7) K4	169
Crawfordsville,Ind. M8	166
Donora,Pa. A7	164
Duluth A7	164
Fairfield,Ala. T2	164
Houston,Tex. S5	169
Jack'ville.Fla (20) M8	175
Johnstown,Pa. B2	164
Joliet,Ill. A7	164
KansasCity,Mo. S5	169
Kokomo,Ind. C16	166
Minnequa,Colo. C10	169
Monessen,Pa. (7) P7	167
Pittsburg,Calif. C11	183
Rankin,Pa. A7	164
S.Chicago,Ill. R2	164
SparrowsPt.,Md. B2	166
Sterling,Ill. (1) N15	164
Worcester,Mass. A7	170

NAILS, Stock	Col.
Chicago (7) W13	167
Cleveland (7) A9	173
(To Wholesalers; per cwt)	
Galveston,Tex. D7	$8.75

NAILS, Cut (100 lb keg) To Dealers (33)	
Conshohocken,Pa. A3	$9.80
Wheeling,W.Va. W10	9.80

TIE WIRE, Automatic Baler (14½ Ga.)(Per 97 lb Net Box)	
Coil No. 3150	
AlabamaCity,Ala. R2	$9.53
Atlanta A11	9.63
Bartonville,Ill. K4	10.13
Buffalo W12	10.05
Crawfordsville,Ind. M8	9.63
Donora,Pa. A7	9.53
Duluth A7	9.53
Houston S5	9.78
Jack'ville,Fla. M8	10.09
Johnstown,Pa. B2	9.53
Joliet,Ill. A7	9.53
KansasCity,Mo. S5	9.78
Kokomo,Ind. C16	9.63
LosAngeles B3	10.32
Minnequa,Colo. C10	9.78
Pittsburg,Calif. C11	10.31
S.Chicago,Ill. R2	9.53
S.SanFrancisco C10	10.31
SparrowsPt.,Md. B2	9.63
Sterling,Ill.(1) N15	9.53
Coil No. 6500 Stand.	
AlabamaCity,Ala. R2	$9.85
Atlanta A11	9.95
Bartonville,Ill. K4	10.45
Buffalo W12	10.35
Crawfordsville,Ind. M8	9.95
Donora,Pa. A7	9.85
Duluth A7	9.85
Houston S5	10.10
Kokomo,Ind. C16	9.95
Jacksonville,Fla. M8	10.41
Johnstown,Pa. B2	9.85
Joliet,Ill. A7	9.85
KansasCity,Mo. S5	10.10
Kokomo,Ind. C16	10.45
LosAngeles B3	10.65
Minnequa,Colo. C10	10.10
Pittsburg,Calif. C11	10.65
S.Chicago,Ill. R2	9.85
S.SanFrancisco C10	10.65
SparrowsPt.,Md. B2	9.95
Sterling,Ill.(1) N15	9.85
Coil Interim	
AlabamaCity,Ala. R2	$9.90
Atlanta A11	10.00
Bartonville,Ill. K4	10.50
Buffalo W12	10.40
Crawfordsville,Ind. M8	10.00
Donora,Pa. A7	9.90
Duluth A7	9.90
Houston S5	10.15
Jacksonville,Fla. M8	10.46
Johnstown,Pa. B2	9.90
Joliet,Ill. A7	9.90
KansasCity,Mo. S5	10.15
Kokomo,Ind C16	10.00
LosAngeles B3	10.70
Minnequa,Colo. C10	10.15
Pittsburg,Calif. C11	10.70
S.Chicago,Ill. R2	9.90
S.SanFrancisco C10	10.70
SparrowsPt.,Md. B2	10.00
Sterling,Ill.(1) N15	9.90

WIRE, Barbed	Col.
AlabamaCity,Ala. R2	184**
Aliquippa,Pa. J5	185§
Atlanta A11	190*
Bartonville,Ill. K4	193
Crawfordsville,Ind. M8	190
Donora,Pa. A7	184†
Duluth A7	184†
Fairfield,Ala. T2	184†
Houston,Tex. S5	189**
Jacksonville.Fla. M8	195
Johnstown,Pa. B2	188*
Joliet,Ill. A7	184†
KansasCity,Mo. S5	189**
Kokomo,Ind. C16	186†
Minnequa,Colo. C10	189**
Monessen,Pa. P7	191*
Pittsburg,Calif. C11	204†
Rankin,Pa. A7	184†
S.Chicago,Ill. R2	184**
S.SanFrancisco C10	207**
SparrowsPoint,Md. B2	190*
Sterling,Ill(1) N15	188*

WOVEN FENCE, 9-15 Ga.	Col.
Ala.City,Ala. R2	176**
Aliq'ppa,Pa. 9-14½ga.J5	184§
Atlanta A11	182*
Bartonville,Ill. K4	187
Crawfordsville.Ind. M8	182
Donora,Pa. A7	176†
Duluth A7	176†
Fairfield,Ala. T2	176†
Houston,Tex. S5	181**
Jacksonville,Fla. M8	187
Johnstown,Pa.(43) B2	180*
Joliet,Ill. A7	176†
KansasCity,Mo. S5	181**
Kokomo,Ind. C16	178†
Minnequa,Colo. C10	181**
Monessen,Pa. 9 ga. P7	185*
Pittsburg,Calif. C11	199†
Rankin,Pa. A7	176†
S.Chicago,Ill. R2	176**
Sterling,Ill.(1) N15	180*

WIRE (16 gage)	An'ld Stone	Galv. Stone
Ala.City,Ala.R2	15.70	17.25**
Bartonville K4	16.10	18.05
Buffalo W12	16.10	....
Cleveland A7	15.70	17.25†
Crawf'dsville M8	15.80	17.75
Fostoria,O. S1	16.20	17.75†
Houston S5	15.95	17.50**
Jacksonville M8	16.05	18.00
Johnstown B2	16.10	18.05*
Kan.City,Mo.S5	15.95	17.50**
Kokomo C16	15.80	17.35†
Minnequa C10	16.05	17.75**
P'lm'r,Mass.W2	16.10	17.65*
Pitts.,Calif. C11	16.05	17.60†
SparrowsPt. B2	16.20	18.15*
Sterling(1) N15	16.10	18.05*
Waukegan A7	15.70	17.25†
Worcester A7	16.00	....

WIRE, Merchant Quality (6 to 8 gage)	An'ld	Galv.
Ala.City,Ala. R2	7.95	8.35**
Aliquippa J5	8.10	8.625§
Atlanta A11	8.05	8.65*
Bartonville(48) K4	8.20	8.80
Buffalo W12	8.10	8.50†
Cleveland A7	7.95	....
Crawfordsville M8	8.05	8.65
Donora,Pa. A7	7.95	8.35†
Duluth A7	7.95	8.35†
Fairfield T2	7.95	8.35†
Houston(48) S5	8.20	8.60**
Jacks-ville,Fla. M8	8.30	8.90
Johnstown B2(48)	7.95	8.55*
Joliet,Ill. A7	7.95	8.35†
Kans.City(48) S5	8.20	8.60**
Kokomo C16	8.05	8.45†
LosAngeles B3	8.90	9.50*
Minnequa, C10	8.20	8.60**
Monessen P7 (48)	8.10	8.70*
Palmer,Mass. W12	8.40	8.80†
Pitts.,Calif. C11	8.90	9.30†
Portsmouth,O. P12	7.95	...
Rankin,Pa. A7	7.95	8.35†
S.Chicago R2	7.95	8.35**
S.SanFran. C10	8.90	9.30**
Spar'wsPt. B2(48)	8.05	8.65*
Sterling(1)(48)N15	7.95	8.55*
Struth'rs,O.(48)Y1	7.95	8.45‡
Worcester,Mass.A7	8.25	8.65†

Based on zinc price of: *13.50c. †5c. §10c. ‡Less than 10c. ††13. **Subject to zinc equalization extras.

BALE TIES, Single Loop	Col.
AlabamaCity,Ala. R2	190
Atlanta A11	192
Bartonville,Ill. K4	197
Crawfordsville,Ind. M8	192
Donora,Pa. A7	190
Duluth A7	190
Fairfield,Ala. T2	190
Houston S5	195
Jacksonville,Fla. M8	197
Joliet,Ill. A7	190
KansasCity,Mo. S5	195
Kokomo,Ind. C16	192
Minnequa,Colo. C10	195
Pitts.,Calif. C11	214
S.Chicago,Ill. R2	190
S.SanFrancisco C10	214
Sterling,Ill. N15	190
SparrowsPoint.,Md. B2	192
Tonawanda,N.Y. B12	169
Williamsport,Pa. S19	175

FENCE POSTS	
ChicagoHts.,Ill. C2, I-2	167
Duluth A7	167
Franklin,Pa. F5	167
Huntington,W. Va. W7	169
Johnstown,Pa. B2	167
Marion,O. P11	167
Minnequa,Colo. C10	172
Sterling,Ill. N15	167
Tonawanda,N.Y. B12	169
Williamsport,Pa. S19	175

FASTENERS

(Base discounts, full container quantity, per cent off list, f.o.b. mill)

BOLTS

Carriage, Machine Bolts	
Full Size Body (cut thread)	
½ in. and smaller;	
6 in. and shorter	55
Longer than 6 in.	46.5
9/16 in. thru 1 in.:	
6 in. and shorter	46.5
Longer than 6 in.	44
1⅛ in. and larger:	
All lengths	44
Undersized Body (rolled thread)	
½ in. and smaller:	
6 in. and shorter	55
Carriage, Machine, Lag Bolts Hot Galvanized:	
½ in. and smaller:	
6 in. and shorter	35
Longer than 6 in.	23
9/16 in. thru 1 in.:	
6 in. and shorter	20
Longer than 6 in.	20
1⅛ in. and larger:	
All lengths	20
Lag Bolts	
All diameters:	
6 in. and shorter	55
Longer than 6 in.	47
Plow and Tap Bolts	
½ in. and smaller by 6 in. and shorter	54
Larger than ½ in. or longer than 6 in.	47
Blank Bolts	47
Step, Elevator, Tire Bolts	54

NUTS

Reg. & Heavy Square Nuts:	
All sizes	59
Square Nuts, Reg. & Heavy, Hot Galvanized:	
All sizes	45
Hex Nuts, Reg. & Heavy, Hot Pressed:	
¾ in. and smaller	63
⅞ in. to 1 in. incl.	59.5
1⅛ in. to 1½ in., incl.	64
1⅝ in. and larger	58
Hex Nuts, Reg. & Heavy, Cold Punched:	
¾ in. and smaller.	63
⅞ in. to 1½ in., incl.	59.5
1⅝ in. and larger	58
Hex Nuts, All Types, Hot Galvanized:	
¾ in. and smaller	50
⅞ in. to 1 in., incl.	46
1⅛ in. to 1½ in., incl.	51
Hex Nuts, Semifinished, Reg. & Heavy (Incl. Slotted):	
¾ in. and smaller	63
⅞ in. to 1½ in., incl.	59.5
1⅝ in. and larger	58
Hex Nuts, Finished (Incl. Slotted and Castellated):	
1 in. and smaller	65
1⅛ in. to 1½ in., incl.	62
1⅝ in. and larger	58

CAP AND SET SCREWS

(Base discounts, packages, per cent off list, f.o.b. mill)

Hex Head Cap Screws, Coarse or Fine Thread	
Bright:	
6 in. and shorter:	
⅝ in. and smaller	47
¾, ⅞ and 1 in. diam.	31
Longer than 6 in.:	
⅝ in. and smaller	18.5
¾, ⅞ and 1 in. diam.	5.5
High Carbon, Heat Treated:	
6 in. and shorter:	
⅝ in. and smaller	34
¾, ⅞ and 1 in. diam.	13
Longer than 6 in.:	
⅝ in. and smaller.	+1
¾, ⅞ and 1 in. diam.	+19
Fillister Head, Coarse Thread:	
Listed Sizes	+31
Flat Head, Coarse Thread.	
¼ in. and smaller by 6 in. and shorter	+57
Set Screws, Square Head, Cup Point, Coarse Thread:	
Through 1 in. diam.:	
6 in. and shorter	11
Longer than 6 in.	+10

RIVETS

F.o.b. Cleveland and/or freight equalized with Pittsburgh, f.o.b. Chicago and/or freight equalized with Birmingham except where equalization is too great.

Structural ½-in., larger	10.85
7/16-in. under	List less 26.5%

BOILER TUBES

Net base c.l. prices, dollars per 100 ft, mill; minimum wall thickness, cut lengths 10 to 24 ft, inclusive.

O.D. In.	B.W. Gage	Seamless H.R.	Seamless C.D.	Elec. Weld H.R.
1	13	....	23.56	22.84
1¼	13	....	27.92	22.68
1½	13	26.34	30.86	25.08
1¾	13	31.12	36.45	29.64
2	13	34.88	40.85	33.21
2¼	13	39.29	46.01	37.42
2¼	12	42.64	49.94	40.61
2½	12	46.98	55.01	44.73
2¾	12	50.86	59.57	48.44
3	12	54.24	63.53	51.66

RAILWAY MATERIALS

	Standard			Tee Rails
RAILS	No. 1	No. 2	All No. 2	60 lb Under
Bessemer,Pa. U5	5.075	4.975	5.025	6.00
Ensley,Ala. T2	5.075	4.975	....	6.00
Fairfield,Ala. T2	....	....	....	6.00
Gary,Ind. U5	5.075	4.975	5.025	...
Huntington,W. Va. W7	....	....	....	6.15
IndianaHarbor,Ind. I-2	5.075	4.975	5.025	...
Johnstown,Pa. B2	....	....	...	(16)6.00
Lackawanna,N.Y. B2	5.075	4.975	...	(16)6.00
Minnequa,Colo. C10	5.075	4.975	....	6.50
Steelton,Pa. B2	5.075	4.975	....	...
Williamsport,Pa. S19	....	....	....	6.15

TIE PLATES	
Fairfield,Ala. T2	6.025
Gary,Ind. U5	6.025
Ind.Harbor,Ind. I-2	6.025
Lackawanna,N.Y. B2	6.025
Minnequa,Colo. C10	6.025
Seattle B3	6.175
Steelton,Pa. B2	6.025
Torrance,Calif. C11	6.175

JOINT BARS	
Bessemer,Pa. U5	6.35
Fairfield,Ala. T2	6.35
Ind.Harbor,Ind. I-2	6.35
Joliet,Ill. U5	6.35
Lackawanna,N.Y. B2	6.35
Minnequa,Colo. C10	6.35
Steelton, Pa. B2	6.35

AXLES	
Ind.Harbor,Ind. S13	8.10
Johnstown,Pa. B2	8.10

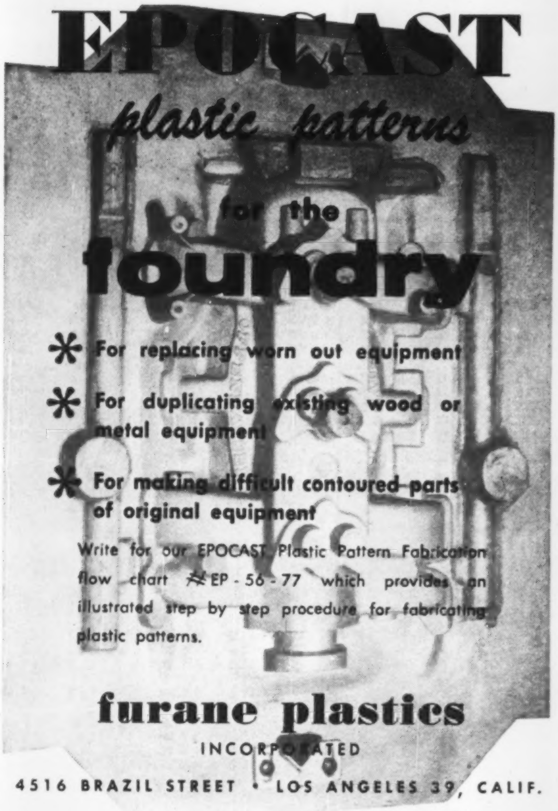
TRACK BOLTS, Untreated	
Cleveland R2	13.10
Lebanon,Pa. B2	13.10
Minnequa,Colo. C10	13.10
Pittsburgh P14	13.10
Seattle B3	13.60

SCREW SPIKES	
Cleveland R2	12.85
Pittsburgh P14	12.85

STANDARD TRACK SPIKES	
Fairfield,Ala. T2	8.775
Ind.Harbor,Ind. I-2, Y1	8.775
KansasCity,Mo. S5	8.775
Lebanon,Pa. B2	8.775
Minnequa, Colo. C10	8.775
Pittsburgh J5	8.775
Seattle B3	9.275
S.Chicago,Ill. R2	8.775
Struthers,O. Y1	8.775
Youngstown R2	8.775

Footnotes

(1) Chicago base.
(2) Angles, flats, bands.
(3) Merchant.
(4) Reinforcing.
(5) 1⅛ to under 1 7/16 in.; 1 7/16 to under 1 15/16 in.; 6.23c; 1 15/16 to 8 in.; inclusive, 6.60c.
(6) Chicago or Birm. base.
(7) To jobbers, 3 cols. lower.
(8) 16 Ga. and heavier.
(9) Merchant quality; add 0.35c for special quality.
(10) Pittsburgh base.
(11) Cleveland & Pitts. base.
(12) Worcester, Mass., base.
(13) Add 0.25c for 17 Ga. & heavier.
(14) Gage 0.143 to 0.249 in.; for gage 0.142 and lighter, 5.80c.
(15) ⅜" and thinner.
(16) 40 lb and under.
(17) Flats only; 0.25 in. & heavier.
(18) To dealers.
(19) Chicago & Pitts. base.
(20) Plus 1c per 100 lb.
(21) New Haven, Conn., base.
(22) Deld. San Francisco Bay area.
(23) Special quality.
(24) Deduct 0.05c, finer than 15 Ga.
(25) Bar mill bands.
(26) Delivered in mill zone, 5.685c.
(27) Bar mill sizes.
(28) Bonderized.
(29) Youngstown base.
(30) Sheared; for universal mill add 0.45c.
(31) Widths over ⅝-in.; 7.30c, for widths ⅝-in. and under by 0.125 in. and thinner.
(32) Buffalo base.
(33) To jobbers, deduct 20c.
(34) 9.60c for cut lengths.
(35) 72" and narrower.
(36) 54" and narrower.
(38) 14 Ga. & lighter; 48" & narrower.
(39) 48" and narrower.
(40) Lighter than 0.035"; 0.035" and heavier, 0.25c higher.
(41) 9.10c for cut lengths.
(42) Mill lengths, f.o.b. mill; deld. in mill zone or within switching limits, 5.685c.
(43) 9-14½ Ga.
(48) 6-7 Ga.
(49) 3⅛-in. and smaller rounds; 8.65c, over 3⅛-in. and other shapes.



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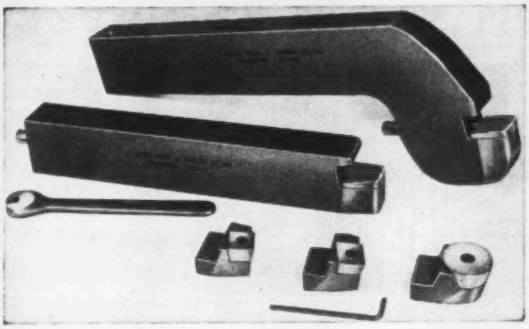

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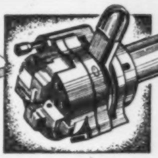

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BAY CITY FORGE CO.
ERIE, PA.

Over a Quarter of a Century of Dependable Service and Quality Products

SEAMLESS STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Size—Inches	2		2½		3		3½		4		5		6	
List Per Ft	37c		58.5c		76.5c		92c		$1.09		$1.48		$1.92	
Pounds Per Ft	3.68		5.82		7.62		9.20		10.89		14.81		19.18	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	+2	+20	4.5	+14.25	7	+11.75	8.5	+10.25	8.5	+10.25	8.25	+10.5	10.75	+8
Ambridge, Pa. N2	+2	....	4.5	....	7	....	8.5	....	8.5	....	8.25	....	10.75	....
Lorain, O. N3	+2	+20	4.5	+14.25	7	+11.75	8.5	+10.25	8.5	+10.25	8.25	+10.5	10.75	+8
Youngstown Y1	0.5	+17.5	4.5	+14.25	7	+11.75	8.5	+10.25	8.5	+10.25	8.25	+10.5	10.75	+8

ELECTRIC WELD STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Youngstown R2	+2	+20	4.5	+14.25	7	+11.75	8.5	+10.25	8.5	+10.25	8.25	+10.5	10.75	+8

BUTTWELD STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Size—Inches	⅛		¼		⅜		½		¾		1		1¼	
List Per Ft	5.5c		6c		6c		8.5c		11.5c		17c		23c	
Pounds Per Ft	0.24		0.42		0.57		0.85		1.13		1.68		2.28	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	....	....	....	....	....	....	12.5	+6.75	15.5	+2.75	18	0.75	20.5	2.5
Alton, Ill. L1	....	....	....	....	....	....	10.5	+8.75	13.5	+4.75	16	+1.25	18.5	0.5
Benwood, W. Va. W10	10	+20.5	+0.25	+27.75	+9.75	+37.25	12.5	+6.75	15.5	+2.75	18	0.75	20.5	2.5
Butler, Pa. F6	10	+20.5	0.5	+27	+8.5	+36	....	....	....	....	....	....	....	....
Etna, Pa. N2	....	....	....	....	....	....	12.5	+6.75	15.5	+2.75	18	0.75	20.5	2.5
Fairless, Pa. N8	....	....	....	....	....	....	10.5	+8.75	13.5	+4.75	16	+1.25	18.5	0.5
Fontana, Calif. K1	....	....	....	....	....	....	0	+19.25	3	+15.25	5.5	+11.75	8	+10
Indiana Harbor, Ind. Y1	....	....	....	....	....	....	11.5	+7.75	14.5	+3.75	17	+0.25	19.5	1.5
Lorain, O. N3	....	....	....	....	....	....	12.5	+6.75	15.5	+2.75	18	0.75	20.5	2.5
Sharon, Pa. S4	11	+19.5	1.5	+26	+7.5	+35	....	....	....	....	....	....	....	....
Sharon, Pa. M6	....	....	....	....	....	....	12.5	+6.75	15.5	+2.75	18	0.75	20.5	2.5
Sparrows Pt., Md. B2	9	+21.5	0.5	+28	+9.5	+37	10.5	+8.75	13.5	+4.75	16	+1.25	18.5	0.5
Wheatland, Pa. W9	11	+19.5	1.5	+26	+7.5	+35	12.5	+6.75	15.5	+2.75	18	0.75	20.5	2.5
Youngstown R2, Y1	....	....	....	....	....	....	12.5	+6.75	15.5	+2.75	18	0.75	20.5	2.5

Size—Inches	1½		2		2½		3		3½		4	
List Per Ft	27.5c		37c		58.5c		76.5c		92c		$1.09	
Pounds Per Ft	2.73		3.68		5.82		7.62		9.20		10.89	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	21	3.5	21.5	4	23	4.75	23	4.75	....	....	....	....
Alton, Ill. L1	19	1.5	19.5	2	21	2.75	21	2.75	....	....	....	....
Benwood, W. Va. W10	21	3.5	21.5	4	23	4.75	23	4.75	13.5	+0.75	13.5	+5.25
Etna, Pa. N2	21	3.5	21.5	4	23	4.75	23	4.75	13.5	+5.25	13.5	+5.25
Fairless, Pa. N3	19	1.5	19.5	2	21	2.75	21	2.75	11.5	+7.25	11.5	+7.25
Fontana, Calif. K1	8.5	+9	9	+8.5	10.5	+7.75	10.5	+7.75	1	+17.75	1	+17.75
Indiana Harbor, Ind. Y1	20	2.5	20.5	3	22	3.75	22	3.75	12.5	+6.25	12.5	+6.25
Lorain, O. N3	21	3.5	21.5	4	23	4.75	23	4.75	....	....	....	....
Sharon, Pa. M6	21	3.5	21.5	4	23	4.75	23	4.75	....	....	....	....
Sparrows Pt., Md. B2	19	1.5	19.5	2	21	2.75	21	2.75	11	+7.25	11	+7.25
Wheatland, Pa. W9	21	3.5	21.5	4	23	4.75	23	4.75	13.5	+5.25	13.5	+5.25
Youngstown R2, Y1	21	3.5	21.5	4	23	4.75	23	4.75	13.5	+5.25	13.5	+5.25

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*Galvanized pipe discounts based on current price of zinc (13.50c, East St. Louis).

Stainless Steel

Representative prices, cents per pound; subject to current lists of extras

AISI Type	—Rerolling—		Forging Billets	H.R. Strip	Wire Rods; C.F. Wire	Bars; Structural Shapes	Plates	Sheets	C.R. Strip; Flat Wire
	Ingot	Slabs							
201	21.25	26.00	....	34.50	....	....	....	46.75	43.25
202	22.75	29.00	35.00	37.50	39.25	41.25	43.25	47.25	47.25
301	22.25	27.00	35.75	35.75	40.25	42.50	44.50	49.25	45.75
302	24.25	30.25	36.50	39.00	41.00	43.25	45.50	50.00	50.00
302B	24.50	31.50	39.25	44.00	43.25	45.50	47.50	54.75	54.75
303	....	30.75	29.50	....	44.00	46.25	48.00	54.50	54.50
304	26.00	32.00	39.00	42.50	43.75	46.00	48.75	53.25	53.25
304L	....	....	46.50	49.50	51.25	53.50	56.25	60.75	60.75
305	27.50	35.25	40.75	45.75	43.75	46.00	49.25	56.50	56.50
308	29.50	38.75	45.50	48.25	50.75	53.50	58.00	60.50	60.50
309	38.25	47.50	56.50	62.00	61.25	64.50	68.25	77.50	77.50
310	47.75	59.25	75.00	81.00	83.25	87.50	89.25	93.00	93.00
314	....	....	....	....	83.25	....	80.25	....	....
316	38.25	47.50	59.75	66.50	66.75	70.25	73.75	78.25	78.25
316L	....	....	67.25	73.00	74.25	77.25	81.25	85.75	85.75
317	46.25	57.75	73.75	84.75	88.00	87.25	90.00	97.00	97.00
321	31.00	33.50	46.25	51.50	50.50	58.25	57.50	63.00	63.00
18-8 CbTa	35.50	44.75	53.50	61.00	59.25	62.25	67.00	76.25	76.25
403	....	....	30.75	....	34.50	36.25	38.75	46.50	46.50
405	18.75	24.50	28.50	34.50	32.50	34.00	36.00	45.00	45.00
410	16.00	20.75	27.25	29.75	31.00	32.50	33.75	38.75	38.75
416	....	....	27.75	....	31.50	38.00	34.75	46.50	46.50
420	....	32.25	33.00	40.25	37.75	39.75	43.50	59.50	59.50
430	16.25	21.00	27.75	30.75	31.50	33.00	34.50	39.25	39.25
430F	....	....	28.25	....	32.00	33.50	35.25	49.75	49.75
431	....	27.75	36.25	....	40.25	42.50	44.25	53.75	58.75
446	....	....	37.75	56.75	42.50	44.75	46.00	67.25	67.25

Stainless Steel Producers Are: Allegheny Ludlum Steel Corp.; Alloy Metal Wire Div., H. K. Porter Co. Inc.; Alloy Tube Div., Carpenter Steel Co.; American Steel & Wire Div., U.S. Steel Corp.; Armco Steel Corp.; Babcock & Wilcox Co.; Bethlehem Steel Co.; J. Bishop & Co.; G. O. Carlson Inc.; Charter Wire Products Co.; Cold Metal Products Co.; Crucible Steel Co. of America; Damascus Tube Co.; Wilbur B. Driver Co.; Driver-Harris Co.; Eastern Stainless Steel Corp.; Elwood Ivins Steel Tube Works Inc.; Firth Sterling Inc.; Ft. Wayne Metals Inc.; Globe Steel Tubes Co.; Helical Tube Co.; Indiana Steel & Wire Co.; Ingersoll Steel Div., Borg-Warner Corp.; Jessop Steel Co.; Johnson Steel & Wire Co. Inc.; Joslyn Mfg. & Supply Co.; Kenmore Metals Corp.; Maryland Fine & Specialty Wire Co.; McInnes Steel Co.; McLouth Steel Corp.; Metal Forming Corp.; National-Standard Co.; National Tube Div., U.S. Steel Corp.; Newman-Crosby Steel Co.; Pacific Tube Co.; Page Steel & Wire Div., American Chain & Cable Co. Inc.; Pittsburgh Rolling Mills Inc.; Republic Steel Corp.; Rodney Metals Inc.; Rome Mfg. Co.; Rotary Electric Steel Co.; Sawhill Tubular Products Inc.; Sharon Steel Corp.; Simonds Saw & Steel Co.; Specialty Wire Co. Inc.; Spencer Wire Corp.; Stainless Welded Products Inc.; Standard Tube Co.; Superior Steel Corp.; Superior Tube Co.; Techalloy Co. Inc.; Timken Roller Bearing Co.; Trent Tube Co.; Tube Methods Inc.; Ulbrich Stainless Steels; United States Steel Corp.; Universal-Cyclops Steel Co.; Wallingford Steel Co.; Washington Steel Corp.

Clad Steel

	—Plates— Carbon Base				Sheets Carbon Base
	5%	10%	15%	20%	20%
Stainless					
302	....	....	....	....	38.25
304	....	34.50	....	41.50	36.25
304-L	....	37.20	....	44.65	....
316	....	38.70	....	46.65	52.25
316-L	....	45.70	....	54.85	....
316-CB	....	45.90	....	54.75	....
321	....	36.85	....	43.40	42.00
347	....	39.50	....	48.45	51.00
405	....	29.20	....	37.05	....
410	....	28.70	....	36.55	....
430	....	28.70	....	36.55	....
Inconel	47.25	57.90	68.50	79.20	....
Nickel	40.00	50.20	60.65	71.05	....
Nickel, Low Carbon	40.30	50.95	61.05	72.50	....
Monel	41.70	51.90	62.15	72.40	....
Copper*	....	....	....	....	46.00

	Strip, Carbon Base —Cold Rolled— 10%	Both Sides
Copper*	24.40	40.65

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*Deoxidized. Production points: Stainless-clad sheets, New Castle, Ind. I-4; stainless-clad plates, Claymont, Del. C22, Coatesville, Pa. L7, New Castle, Ind. I-4 and Washington, Pa. J8; nickel, inconel, monel-clad plates, Coatesville L7; copper-clad strip, Carnegie, Pa. S18.

Tool Steel

Grade	$ per lb	Grade	$ per lb
Regular Carbon	0.290	Cr Hot Work	0.45-0.495
Extra Carbon	0.345	W-Cr Hot Work	0.048-0.475
Special Carbon	0.41-0.45	V-Cr Hot Work	0.460
Oil Hardening	0.450	Hi-Carbon-Cr	0.830

Grade by Analysis (%)

W	Cr	V	Co	Mo	$ per lb
20.25	4.25	1.6	12.25	...	4.170
18.25	4.25	1	4.75	...	2.885
18	4	2	9	...	2.7575
18	4	2	....	...	1.845
18	4	1	....	...	1.680
9	3.5	..	....	...	1.275
13.5	4	3	....	...	1.945
13.75	3.75	2	5	...	2.825
6.4	4.5	1.9	....	5	1.185
6	4	3	....	6	1.430
1.5	4	1	....	8.5	1.040

Tool steel producers include: A4, A8, B2, B8, C4, C9, C13, C18, F2, J3, M14, S8, U4, V2, and V3.

They passed the test with colors flying...

Leading steel producers are turning Pilot Single Stack Setups into production installations

Last year, more Lee Wilson Single Stack coil annealing furnaces were set into operation than ever before. These included many pilot installations where Single Stack furnaces had been under close observation for long periods of time. Users found that the Single Stack units permitted them to operate with far less process inventory and that they could get better quality, faster at less cost.

Today the Lee Wilson Single Stack furnace is the "hottest" item in the annealing field — it has passed the test with flying colors — and is destined to become the standard of the industry.

	STARTED	ADDED	TOTAL
COMPANY A	1	29	30
COMPANY B	1	24	25
COMPANY C	4	14	18
COMPANY D	1	9	10
COMPANY E	2	42	44

Lee Wilson ENGINEERING COMPANY, INC.
20005 WEST LAKE ROAD • CLEVELAND 16, OHIO

SINGLE-STACK RADIANT TUBE ANNEALING FURNACES
MAKE THE BEST METALS BETTER

* ORIGINATORS AND LEADING PRODUCERS OF SINGLE-STACK RADIANT TUBE FURNACES

Pig Iron

F.o.b. furnace prices in dollars per gross ton, as reported to STEEL. Minimum delivered prices are approximate and do not include 3% federal tax.

	Basic	No. 2 Foundry	Malleable	Bessemer
Birmingham District				
AlabamaCity,Ala. R2	58.50	59.00	....	....
Birmingham R2	58.50	59.00‡	....	....
Birmingham U6	....	59.00‡	63.00	....
Woodward,Ala. W15	58.50	59.00‡	63.00	....
Cincinnati, deld.	....	66.70	....	....
Buffalo District				
Buffalo H1, R2	62.50	63.00	63.50	64.00
Tonawanda,N.Y. W12	62.50	63.00	63.50	64.00
N.Tonawanda,N.Y. T9	....	63.00	63.50	64.00
Boston, deld.	73.79	74.29	74.79	....
Rochester,N.Y., deld.	65.52	66.02	66.52	....
Syracuse,N.Y., deld.	66.62	67.12	67.62	....
Chicago District				
Chicago I-3	62.50	63.00	63.00	63.50
Gary,Ind. U5	62.50	....	63.00	....
S.Chicago,Ill. R2	62.50	....	63.00	....
S.Chicago,Ill. Y1	62.50	63.00	63.00	....
S.Chicago,Ill. U5	62.50	....	63.00	63.50
S.Chicago,Ill. W14	62.50	....	63.00	63.50
Milwaukee, deld.	64.96	65.46	65.46	65.96
Muskegon,Mich., deld.	....	76.83	76.83	....
Cleveland District				
Cleveland R2, A7	62.50	63.00	63.00	63.50
Akron,O., deld.	65.25	65.75	65.75	66.25
Mid-Atlantic District				
Birdsboro,Pa. B10	64.50	65.00	65.50	66.00
Chester,Pa. P4	64.50	65.00	65.50	....
Philadelphia, deld.	66.26	66.76	67.26	....
Swedeland,Pa. A3	64.50	65.00	65.50	66.00
New York, deld	....	71.20	71.70	....
Newark,N.J., deld.	68.52	69.02	69.52	70.02
Philadelphia, deld.	66.38	66.88	67.38	67.88
Troy,N.Y. R2	64.50	65.00	65.50	66.00
Pittsburgh District				
NevilleIsland,Pa. P6	62.50	63.00	63.00	63.50
Pittsburgh (N&S sides), Aliquippa, deld.	....	64.45	64.45	64.98
McKeesRocks,Pa. deld.	....	64.10	64.10	64.63
Lawrenceville, Homestead, Wilmerding, Monaca,Pa., deld.	....	64.76	64.76	65.29
Verona, Trafford,Pa., deld	64.79	65.32	65.32	65.85
Brackenridge,Pa., deld.	65.10	65.60	65.60	66.13
Bessemer,Pa. U5	62.50	....	63.00	63.50
Clairton,Rankin,S.Duquesne,Pa. U5	62.50	....	....	....
Midland,Pa. C18	62.50	....	....	....

	Basic	No. 2 Foundry	Malleable	Bessemer
Youngstown District				
Hubbard,O. Y1	....	....	63.00	....
Sharpsville,Pa. S6	62.50	....	63.00	63.50
Youngstown Y1	....	....	63.00	63.50
Mansfield,O., deld.	67.40	....	67.90	68.40
Duluth I-3	62.50	63.00	63.00	63.50
Erie,Pa. I-3	62.50	63.00	63.00	63.50
Everett,Mass. E1	64.50	65.00	65.50	....
Fontana,Calif. K1	70.00	70.50	....	....
Geneva,Utah C11	62.50	63.00	....	....
GraniteCity,Ill. G4	64.40	64.90	65.40	....
Ironton,Utah C11	62.50	63.00	....	....
LoneStar,Tex. L6	58.50*	59.00†	....	....
Minnequa,Colo. C10	64.50	65.00	65.50	....
Rockwood,Tenn. T3	....	59.00‡	63.00	....
Toledo,O. I-3	62.50	63.00	63.00	63.50
Cincinnati, deld.	68.26	68.76	....	....

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*Phos. 0.51-0.75%; Phos. 0.31-0.50%, $59.50.

†Phos. 0.51-0.75%; Phos. 0.31-0.50%, $60.

‡Phos. 0.70-0.90%; intermediate (Phos. 0.31-0.69%), $60.

PIG IRON DIFFERENTIALS

Silicon: Add 50 cents per ton for each 0.25% Si or percentage thereof over base grade, 1.75-2.25%, except on low phos. iron on which base is 1.75-2.00%.

Manganese: Add 50 cents per ton for each 0.50% manganese over 1% or portion thereof.

Nickel: Under 0.05% no extra; 0.50-0.74%, inclusive, add $2 per ton and each additional 0.25%, add $1 per ton.

BLAST FURNACE SILVERY PIG IRON, Gross Ton

(Base 6.00-6.50% silicon; add $1.25 for each 0.5% Si; 75 cents for each 0.50% Mn over 1%)

Jackson,O. I-3, J1	71.50
Buffalo H1	72.75

ELECTRIC FURNACE SILVERY IRON, Gross Ton

(Base 14.01-14.50% silicon; add $1 for each 0.5% Si to 18%; $1 for each 0.50% Mn over 1%; $2 per gross ton premium for 0.045% max P)

CalvertCity,Ky. P15	*$105.50*
NiagaraFalls,N.Y. P15	*105.50*
Keokuk,Iowa, Open-hearth & Fdry, freight allowed K2	110.00
Keokuk, O.H. & Fdry, 12½ lb piglets, 16% Si, frgt allowed K2	113.00

LOW PHOSPHORUS PIG IRON, Gross Ton

Lyles,Tenn. T3 (Phos. 0.035% max)	$76.50
Rockwood,Tenn. T3 (Phos. 0.035% max)	76.50
Troy,N.Y. R2 (Phos. 0.035% max)	70.50
Philadelphia, deld.	78.26
Cleveland A7 (Intermediate) (Phos. 0.036-0.075% max)	67.50
Duluth I-3 (Intermediate) (Phos. 0.036-0.075% max)	67.50
Erie,Pa. I-3 (Intermediate) (Phos. 0.036-0.075% max)	67.50
NevilleIsland,Pa. P6 (Intermediate) (Phos. 0.036-0.075% max)	67.50

Warehouse Steel Products

Representative prices, per pound, subject to extras, f.o.b. warehouse. City delivery charges are 15 cents per 100 lb except: St. Paul, 25 cents; Moline, Norfolk, Richmond, Washington, 20 cents; Baltimore, Boston, Los Angeles, New York, Philadelphia, Portland, San Francisco, Spokane, 10 cents; Atlanta, Houston, Seattle no charge.

	SHEETS				STRIP	BARS					PLATES	
	Hot-Rolled	Cold-Rolled	Gal. 10 Ga.†	Stainless Type 302	Hot-Rolled*	H.R. Merchant Qual.	H.R. Spec. Qual.	C.F. Rds.‡	H.R. Alloy 4140††[5]	Standard Structural Shapes	Carbon	Floor
Atlanta	8.07§	9.27§	9.83§	....	8.16	8.30	...	10.14	....	8.44	8.40	10.22
Baltimore	7.79	8.99	9.12	....	8.27	8.34	8.87	9.09[3]	15.69	8.57	8.12	10.81
Birmingham	7.68§	8.88§	8.85§	....	7.78	7.91	8.44	10.04	....	8.05	8.01	10.04
Boston	8.70	9.73	11.02	....	8.79	8.88	9.43	10.71	14.46	8.90	8.98	10.39
Buffalo	7.75	8.90	10.72	....	8.00	8.00	8.70	8.70	14.30	8.25	8.25	9.80
Chattanooga	7.90§	9.10§	9.10§	....	8.00	8.13	8.66	9.96	....	8.27	8.23	9.98
Chicago	7.70	8.90	9.70	....	7.78	7.91	8.44	8.35	13.95	8.05	8.01	9.26
Cincinnati	7.82	8.89	9.75	....	8.06	8.19	8.72	8.82	14.23	8.55	8.34	9.53
Cleveland	7.68	8.88	9.60	....	7.88	7.99	8.52	8.60	14.03	8.38	8.21	9.46
Denver	9.55	11.09	12.41	....	9.70	9.75	...	10.54	18.89	9.60	9.50	11.15
Detroit	7.91	9.13	10.02	....	8.10	8.18	8.71	8.68	14.19	8.55	8.33	9.49
Erie, Pa.	7.75	8.88	9.60[10]	....	7.90	8.00	8.65	8.70[10]	....	8.35	8.20	9.50
Houston	8.70	9.65	10.99	....	8.80	8.95	9.50	10.55	15.00	8.90	8.60	10.10
Jackson, Miss.	8.00§	9.20§	9.22§	....	8.10	8.23	8.76	10.14	....	8.37	8.33	10.08
Los Angeles	8.90	10.65	11.65	....	9.10	8.80	9.50	11.70	15.25	8.95	9.35	11.50
Milwaukee	7.82	9.02	9.82	....	7.90	8.03	8.56	8.57	14.07	8.24	8.13	9.38
Moline, Ill.	8.05	9.25	10.05	....	8.13	8.26	...	8.70	....	7.78	8.36	...
New York	8.35	9.53	10.23	57.73	8.81	8.83	9.38	10.61	14.37	8.74	8.78	10.05
Norfolk, Va.	7.85	...	...	....	8.30	8.35	...	10.80	....	8.60	8.10	9.60
Philadelphia	7.89	9.08	10.12	....	8.58	8.37	8.90	9.12	14.15	8.38	8.28	9.37
Pittsburgh	7.68	8.88	10.05	50.00	7.88	7.91	8.44	8.60	13.95	8.05	8.01	9.26
Portland, Oreg.	8.90	9.65	11.40	....	9.05	8.95	...	13.55	14.60	8.90	8.70	11.60
Richmond, Va.	8.05	...	10.09	....	8.45	8.70	9.20	10.00	....	8.80	8.35	9.70
St. Louis	8.02	9.21	10.03	....	8.11	8.25	8.78	8.93	14.28	8.48	8.34	9.59
St. Paul	8.29	9.49	10.31	....	8.39	8.52	...	9.21	....	8.75	8.71	9.87
San Francisco	8.75	10.30	10.80	....	8.95	8.80	9.35	12.30	15.25	8.85	8.85	11.15
Seattle	9.35	10.45	11.55	....	9.50	9.30	9.85	13.15	15.55	9.15	9.05	11.25
Spokane, Wash.	9.35	10.50	11.55	....	9.50	9.30	9.85	13.15	16.30	9.15	9.05	11.25
Washington	8.37	10.57	...	....	9.06	8.92	...	9.67	....	9.15	8.70	10.14

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*Prices do not include gage extras; †prices include gage and coating extras (based on 12.50c zinc at Los Angeles and 13.50c at other points), except in Birmingham (coating extra excluded); ‡includes 35-cent bar qual'ty extras; **⅛-in. and heavier; ††as annealed; §42 in. and under.

Base quantities, 2000 to 4999 lb except as noted; cold-rolled strip and cold-finished bars, 2000 lb and over except in Seattle, 2000 to 9999 lb, and in Los Angeles, 6000 lb and over; stainless sheets, 8000 lb except in Chicago, New York and Boston, 10,000 lb and in San Francisco, 2000 to 4999 lb; hot-rolled products on West Coast, 2000 to 9999 lb; [3]—400 to 999 lb; [5]—1000 to 1999 lb; [8]—2000 to 3999 lb; [10]—2000 lb and over.

Metallurgical Coke . . .

Metallurgical Coke Prices, Page 505

Demand for foundry coke is picking up. A good first quarter appears to be in the making, but it is felt all requirements can be met without strain.

Delivered prices on coke in the Chicago area are gaged by the price of fuel shipped to the district from St. Paul ovens, since the rate on this haul is favorable. The understanding is that the 10-cent a ton higher freight allowed recently by the Interstate Commerce Commission will not be applied immediately on shipments from St. Paul.

Structural Shapes . . .

Structural Shape Prices, Page 493

Structural shape shipments totaled 4,313,011 net tons in the first 10 months of 1956 (latest available data). This averaged 431,301 tons per month, and compares with average monthly shipments of 394,749 in all of 1955. Shipments in 1956 represented 6.3 per cent of the total steel tonnage moved by the mills, comparing with 5.6 per cent in 1955.

Heavy demand for structurals marked the yearend. Contract for 27,120 tons for Office Building No. 15 (*Time-Life*), Rockefeller Plaza, New York, was placed with the Bethlehem Steel Co., and formal announcement of the placing of 36,000 tons for another office structure at 33 West 51st St., New York, is expected momentarily. In addition, a considerable volume of smaller work is being placed in the East.

Structural steel demand from three major consumers competing with the construction industry for tonnage (railroads, shipbuilding and warehouses) will hold high this year.

Pig Iron . . .

Pig Iron Prices, Page 502

E. J. Lavino & Co., Philadelphia, advanced standard ferromanganese prices $20 a ton to $255, Sheridan, Pa., effective Dec. 28. This follows action by Electro Metallurgical Co., New York, earlier in the month.

STRUCTURAL SHAPES . . .

STRUCTURAL STEEL PLACED

4000 tons, 12 tainter gates and other equipment, Rocky Reach power project, Columbia river, to Todd Shipyards Corp., Seattle, $3,029,112, by Chelan County P.U.D. No. 1, Wenatchee, Wash.

STRUCTURAL STEEL PENDING

4250 tons, state tunnel program, Pittsburgh, bids March 1; also required are 1061 tons of reinforcing bars, 214 tons of steel wire fabric, and 136 tons of miscellaneous metals.

4000 tons, tunnel supports, Clear Creek tunnel, Trinity river, Central Valley project, northern California; joint low bid of $36,644,556 to the Bureau of Reclamation, Weaverville, Calif., by Shea Co., Kaiser Engineers Inc., Morrison-Knudsen Co., Macco Corp., and Raymond Concrete Pile Co., Alhambra, Calif.; 43.4 per cent above estimate.

3600 tons, Colorado river, 1028-ft single span bridge; Peter Kewit Sons Co., and Judson, Pacific Murphy Co., Emeryville, Calif., joint low at $4,139,227 to the Bureau of Reclamation, Kanab, Utah; project also involves 170 tons of reinforcing bars; low bid is 40 per cent over estimate.

REINFORCING BARS . . .

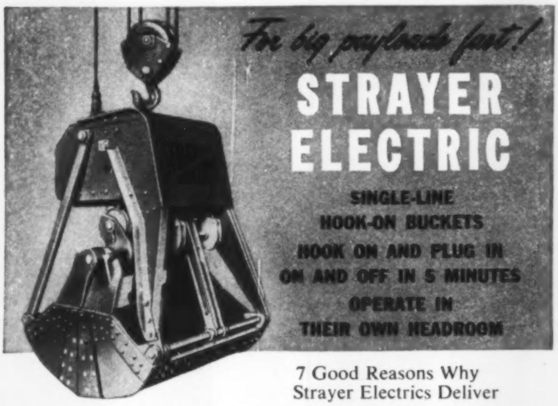
REINFORCING BARS PENDING

17,500 tons, Ice Harbor dam, Snake river; general bids in to the U.S. Engineer, Walla Walla, Wash.

7250 tons, Trinity river, Valley project, northern California; joint low bids in to the Bureau of Reclamation, Weaverville, Calif.

4350 tons, Trinity dam, northern California; bids to the Bureau of Reclamation, Weaverville, Calif., Feb. 5.

733 tons, Tri-State toll route contract T-10A, including precast concrete bridges, Maine and Northfield townships, Cook county, Ill., for the Illinois State Toll Highway Commission; bids Jan. 3.



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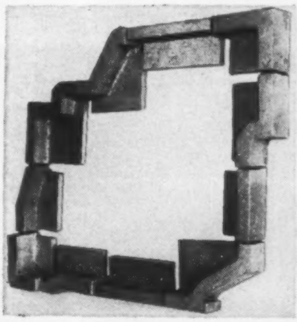

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Ferroalloys

MANGANESE ALLOYS

Spiegeleisen: Carlot, per gross ton, Palmerton, Pa. 21-23% Mn, $102; 19-21% Mn, 1-3% Si, $99.50; 16-19% Mn, $97.50.

Standard Ferromanganese: (Mn 74-76%, C 7% approx.) Base price per net ton $235, Johnstown, Duquesne; $255, Sheridan, Pa., Alloy, W. Va.; Ashtabula, Marietta, O.; Sheffield, Ala.; Portland, Oreg. Add or subtract $2 for each 1% or fraction thereof of contained manganese over 76% or under 74%, respectively.

(Mn 79-81%). Lump $223 per net ton, f.o.b. Anaconda or Great Falls, Mont. Add $2.60 for each 1% above 81%; subtract $2.60 for each 1% below 79%, fractions in proportion to nearest 0.1%.

Low-Carbon Ferromanganese, Regular Grade: (Mn 85-90%). Carload, lump, bulk, max, 0.07% C, 35.1c per lb of contained Mn, carload packed 36.4c, ton lots 37.9c, less ton 39.1c. Delivered. Deduct 1.5c for max 0.15% C grade from above prices, 3c for max 0.30% C, 3.5c for max 0.50% C, and 6.5c for max 75% C—max 7% Si. **Special Grade:** (Mn 90% min, C 0.07% max, P 0.06% max). Add 2.05c to the above prices. Spot, add 0.25c.

Medium-Carbon Ferromanganese: (Mn 80-85%, C 1.25-1.5%, Si 1.5% max). Carload, lump, bulk, 25.5c per lb of contained Mn, packed, carload 26.8c, ton lot 28.4c, less ton 29.6c. Delivered. Spot, add 0.25c.

Manganese Metal: 2" x D (Mn 95.5% min Fe 2% max, Si 1% max, C 0.2% max). Carload, lump, bulk, 45c per lb of metal; packed, 45.75c; ton lot 47.25c; less ton lots 49.25c. Delivered. Spot, add 2c.

Electrolytic Manganese Metal: Min carload, 33c; 2000 lb to min carload, 35c; 500 lb to 1999 lb, 37c: 50 lb cans, add 0.5c per lb. Premium for hydrogen-removed metal, 0.75c per lb. Prices are f.o.b. cars, Knoxville, Tenn., freight allowed to St. Louis or to any point east of Mississippi; or f.o.b. Marietta, O., freight allowed.

Silicomanganese: (Mn 65-68%). Contract, lump, bulk 1.50% C grade, 18-20% Si, 13.8c per lb of alloy. Packed, c.l. 15c, ton 15.45c, less ton 16.45c, f.o.b. Alloy, W. Va., Ashtabula, O., Marietta, O., Sheffield, Ala., Portland, Oreg. For 2% C grade, Si 15-17%, deduct 0.2c from above prices. For 3% C grade, Si 12-14.5%, deduct 0.4c from above prices. Spot, add 0.25c.

TITANIUM ALLOYS

Ferrotitanium Low-Carbon: (Ti 20-25%, Al 3.5% max, Si 4% max, C 0.10% max). Contract, ton lot, 2" x D, $1.50 per lb of contained Ti; less ton $1.55. (Ti 38-43%, Al 8% max, Si 4% max, C 0.10% max). Ton lot $1.35, less ton $1.37 f.o.b. Niagara Falls, N. Y., freight allowed to St. Louis. Spot, add 5c.

Ferrotitanium, High-Carbon: (Ti 15-18%, C 6-8%). Contract $200 per ton, f.o.b. Niagara Falls, N. Y., freight allowed to destinations east of Mississippi river and north of Baltimore and St. Louis.

Ferrotitanium, Medium-Carbon: (Ti 17-21%, C 2-4.5%). Contract $225 per ton, f.o.b. Niagara Falls, N. Y., freight not exceeding St. Louis rate allowed.

CHROMIUM ALLOYS

High-Carbon Ferrochrome: Contract, c.l. lump, bulk 27.75c per lb of contained Cr; c.l. packed 29.3c, ton lot 31.05c; less ton 32.45c. Delivered. Spot, add 0.25c.

Low-Carbon Ferrochrome: (Cr 67-71%). Contract, carload, lump, bulk, C 0.025% max (Simplex) 34.75c per lb contained Cr, 0.02% max 41.5c, 0.03% max 41c, 0.06% max 39.5c, 0.1% max 39c, 0.15% max 38.75c, 0.2% max 38.5c, 0.5% max 38.25c, 1.0% max 37.5c, 1.5% max 37.35c, 2.0% max 37.25c. Ton lot, add 3.4c, less ton add 5.1c. Carload packed add 1.75c. Delivered. Spot, add 0.25c.

Foundry Ferrochrome, High-Carbon: (Cr 62-66%, C 5-7%, Si 7-10%). Contract, c.l., 2 in. x D, bulk 29.05c per lb contained Cr. Packed, c.l. 30.65c, ton 32.45c, less ton 33.95c. Delivered. Spot, add 0.25c.

Foundry Ferrosilicon Chrome: (Cr 50-54%, Si 28-82%, C 1.25% max). Contract, carload, packed, 8 M x D, 20.85c, per lb of alloy, ton lot 22.10c; less ton lot 23.3c. Delivered. Spot, add 0.25c.

Low-Carbon Ferrochrome-Silicon: (Cr 39-41%, Si 42-49%, C 0.05% max). Contract, carload, lump, 4" x down and 2" x down, bulk, 41.35c per lb of contained Cr; 1" x down, bulk 42.35c. Delivered.

Chromium Metal, Electrolytic: Commercial grade (Cr 99.8% min, metallic basis, Fe 0.2% max). Contract, carlot, packed 2" x D plate (about ⅛" thick) $1.29 per lb, ton lots $1.31, less ton lots $1.33. Delivered. Spot, add 5c.

VANADIUM ALLOYS

Ferrovanadium: Open-hearth Grade (V 50-55%, Si 8% max, C 3% max). Contract, any quantity, $3.20 per lb of contained V. Delivered. Spot, add 10c. **Special Grade** (V 50-55% or 70-75%, Si 2% max, C 0.5% max) $3.30. **High Speed Grade** (V 50-55%, or 70-75%, Si 1.50% max, C 0.20% max) $3.40.

Grainal: Vanadium Grainal No. 1, $1.05 per lb; No. 6, 68c; No. 79, 50c, freight allowed.

Vanadium Oxide: Contract, less carload lots, packed, $1.38 per lb contained V_2O_5, freight allowed. Spot, add 5c.

SILICON ALLOYS

25-30% Ferrosilicon: Contract, carload, lump, bulk, 20.0c per lb of contained Si. Packed 21.40c; ton lot 22.50c f.o.b. Niagara Falls, N. Y., freight not exceeding St. Louis rate allowed.

50% Ferrosilicon: Contract, carload, lump, bulk, 13.9c per lb of contained Si. Packed c.l. 16.4c, ton lot 17.85c, less ton 19.5c, f.o.b. Alloy, W. Va., Ashtabula, Marietta, O., Sheffield, Ala., and Portland, Oreg. Spot, add 0.45c.

Low Aluminum 50% Ferrosilicon: (Al 0.40% max). Add 1.55c to 50% ferrosilicon prices.

65% Ferrosilicon: Contract, carload, lump, bulk, 15.25c per pound contained silicon. Packed, c.l. 17.25c, ton lot, 19.05c; less ton 20.4c. Delivered. Spot, add 0.35c.

75% Ferrosilicon: Contract, carload, lump, bulk, 16.4c per lb of contained Si. Packed, c.l. 18.30c, ton lot 19.95c, less ton 21.2c. Delivered. Spot, add 0.3c.

90% Ferrosilicon: Contract, carload, lump, bulk, 19.5c per lb of contained Si. Packed, c.l. 21.15c, ton lot 22.55c, less ton 23.6c. Delivered. Spot, add 0.25c.

Silicon Metal: (Mn 98% Si, 0.75% max Fe, 0.07% max Ca). C.l. lump, bulk 21.5c per lb of Si. Packed, c.l. 23.15c, ton lot 24.45c, less ton 25.45c. Add 0.5c for max 0.03% Ca grade. Deduct 0.5c for max 2% Fe grade analyzing min 96.5% Si. Spot, add 0.25c.

Alsifer: (Approx. 20% Al, 40% Si, 40% Fe). Contract, basis f.o.b. Niagara Falls, N. Y., lump, carload, bulk, 10.65c per lb of alloy, ton lot, packed, 11.8c.

ZIRCONIUM ALLOYS

12-15% Zirconium Alloy: (Zr 12-15%, Si 39-43%, C 0.20% max). Contract, c.l. lump, bulk 9.25c per lb of alloy. Packed, c.l. 10.45c, ton lot 11.6c, less ton 12.45c. Delivered. Spot, add 0.25c.

35-40% Zirconium Alloy: (Zr 35-40%, Si 47-52%, Fe 8-12%, C 0.50% max). Contract, carload, lump, packed 27.25c per lb of alloy, ton lot 28.4c, less ton 29.65c. Freight allowed. Spot, add 0.25c.

BORON ALLOYS

Ferroboron: (B 17.50% min, Si 1.50% max, Al 0.50% max, C 0.50% max). Contract, 100 lb or more 1" x D, $1.20 per lb of alloy; less than 100 lb $1.30. Delivered. Spot, add 5c. F.o.b. Washington, Pa., prices, 100 lb and over, are as follows: Grade A (10-14% B) 85c per lb; Grade B (14-18% B) $1.20; Grade C (19% min B) $1.50.

Borosil: (3 to 4% B, 40 to 45% Si). Carload, bulk, lump or 3" x D, $5.25 per lb of contained B. Packed, carload $5.40, ton to c.l. $5.50, less ton $5.60. Delivered.

Bortam: (B 1.5%-1.9%). Ton lots, 45c per lb; smaller lots, 50c per lb.

Carbortam: (B 1 to 2%). Contract, lump, carloads 9.50c per lb, f.o.b. Suspension Bridge, N. Y., freight allowed same as high-carbon ferrotitanium.

CALCIUM ALLOYS

Calcium-Manganese-Silicon: (Ca 16-20%, Mn 14-18% and Si 53-59%). Contract, carload, lump, bulk 23c per lb of alloy, carload packed 24.25c, ton lot 26.15c, less ton 27.15c. Delivered. Spot, add 0.25c.

Calcium-Silicon: (Ca 30-33%, Si 60-65%, Fe 1.5-3%). Contract, carload, lump, bulk 24c per lb of alloy, carload packed 25.65c, ton lot 27.95c, less ton 29.45c. Delivered. Spot, add 0.25c.

BRIQUETTED ALLOYS

Chromium Briquets: (Weighing approx. 3⅝ lb each and containing 2 lb of Cr). Contract, carload, bulk, 19c per lb of briquet, carload packed in box pallets 19.2c, in bags 20.1c; 3000 lb to c.l. in box pallets 20.4c; 2000 lb to c.l. in bags, 21.3c; less than 2000 lb in bags 22.2c. Delivered. Add 0.25c for notching. Spot, add 0.25c.

Ferromanganese Briquets: (Weighing approx. 3 lb and containing 2 lb of Mn). Contract, carload, bulk 14.8c per lb of briquet, c.l. packed pallets 15c, bags 16c; 3000 lb to c.l., pallets 16.2c; 2000 lb to c.l. bags, 17.2c, less ton 18.1c. Delivered. Add 0.25c for notching. Spot, add 0.25c.

Silicomanganese Briquets: (Weighing approx. 3½ lb and containing 2 lb of Mn and approx. ½ lb of Si). Contract, c.l. bulk 15.1c per lb of briquet, c.l. packed, pallets, 15.8c; bags 16.3c, 3000 lb to c.l., pallets, 16.5c; 2000 lb to c.l., bags 17.5c; less ton 18.4c. Delivered. Add 0.25c for notching. Spot, add 0.25c.

Silicon Briquets: (Large size—weighing approx. 5 lb and containing 2 lb of Si). Contract, carload, bulk, 7.7c per lb of briquet, packed, pallets, 7.9c; bags 8.9c; 3000 lb to c.l., pallets 9.5c; 2000 lb to c.l. bags 10.5c; less ton 11.4c. Delivered. Spot, add 0.25c. (Small size—weighing approx. 2½ lb and containing 1 lb of Si). Carload, bulk 7.8c. Packed, pallets 8.05c; bags 9.05c; 3000 lb to c.l. pallets 9.65c; 2000 lb to c.l. bags 10.65c; less ton 11.55c. Delivered. Add 0.25c for notching, small size only. Spot, add 0.25c.

Molybdic-Oxide Briquets: (Containing 2½ lb of Mo each) $1.41 per pound of Mo contained, f.o.b. Langeloth, Pa.

TUNGSTEN ALLOYS

Ferrotungsten: (70-80%). 5000 lb W or more $3.15 per lb of contained W; 2000 lb W to 5000 lb W, $3.25; less than 2000 lb W, $3.37. Delivered.

OTHER FERROALLOYS

Ferrocolumbium: (Cb 50-60%, Si 8% max, C 0.4% max). Contract, ton lot, 2" x D, $6.90 per lb of contained Cb. Delivered. Spot, add 10c.

Ferrotantalum—Columbium: (Cb 40% approx., Ta 20% approx., and Cb plus Ta 60% min, C 0.30% max). Ton lots 2" x D, $4.95 per lb of contained Cb plus Ta, delivered; less ton lots $5.

SMZ Alloy: (Si 60-65%, Mn 5-7%, Zr 5-7%, Fe 20% approx.). Contract, c.l. packed ½-in. x 12 M 19c per lb of alloy, ton lots 20.15c, less ton 21.4c. Delivered. Spot, add 0.25c.

Graphidox No. 5: (Si 48-52%, Ca 5-7%, Ti 9-11%). C.l. packed, 19c per lb of alloy, ton lots 20.15c; less ton lots 21.4c, f.o.b. Niagara Falls, N. Y.; freight allowed to St. Louis.

V-5 Foundry Alloy: (Cr 38-42%, Si 17-19%, Mn 8-11%). C.l. packed 18.1c per lb of alloy; ton lots 19.55c; less ton lots 20.8c, f.o.b. Niagara Falls, N. Y., freight allowed to St. Louis.

Simanal: (Approx. 20% each Si, Mn, Al; bal. Fe). Lump, carload, bulk 18.50c. Packed c.l. 19.50c, 2000 lb to c.l. 20.50c, less than 2000 lb 21c per lb of alloy. Delivered.

Ferrophosphorus: (23-25% based on 24% P content with unitage of $4 for each 1% of P above or below the base); carload, f.o.b. sellers' works, Mt. Pleasant, Siglo, Tenn., $90 per gross ton.

Ferromolybdenum: (55-75%). Per lb contained Mo, in 200-lb container, f.o.b. Langeloth and Washington, Pa., $1.68 in all sizes except powdered which is $1.74.

Technical Molybdic-Oxide: Per lb contained Mo, in cans, $1.39; in bags, $1.38, f.o.b. Langeloth and Washington, Pa.

Ores

Lake Superior Iron Ore

(Prices effective for the 1956 shipping season, gross tons, 51.50% iron natural, rail of vessel, lower lake ports.)

Old range bessemer	$11.25
Old range nonbessemer	11.10
Mesabi bessemer	11.00
Mesabi nonbessemer	10.85
Open-hearth lump	12.10
High phos.	10.85

The foregoing prices are based on upper lake rail freight rates, lake vessel freight rates, handling and unloading charges, and taxes thereon, which were in effect Dec. 1, 1955, and increases or decreases after such date are for seller's account.

Eastern Local Iron Ore

Cents per unit, deld. E. Pa.

Foundry and basic 52-62% concentrates contract	17.00-18.00

Foreign Iron Ore

Cents per unit, c.i.f. Atlantic ports

Swedish basic, 65%	25.00
N. African hematite (spot) ..nom.	24.00-25.00
Brazilian iron ore, 68-69%	33.00-34.00

Tungsten Ore

Net ton unit, before duty

Foreign, wolframite, good commercial quality	$28.50-29.00
Domestic, concentrates,mine	55.00

Manganese Ore

Mn 46-48%, Indian (export tax included), $1.60-1.70 per long ton unit, c.i.f. U.S. ports, duty for buyer's account; other than Indian, $1.45-1.50; contracts by negotiation.

Chrome Ore

Gross ton f.o.b. cars New York, Philadelphia, Baltimore, Charleston, S. C., plus ocean freight differential for delivery to Portland, Oreg., Tacoma, Wash.

Indian and Rhodesian

48% 3:1	$54.00-57.00
48% 2.8:1	51.00-54.00
48% no ratio	43.00-45.00

South African Transvaal

48% no ratio	$37.50-39.00
44% no ratio	26.00-27.00

Turkish

48% 3:1	$60.00-63.00

Domestic

Rail nearest seller

18% 3:1	$39.00

Molybdenum

Sulphide concentrate, per lb of Mo content. mines, unpacked	$1.18

Antimony Ore

Per unit of Sb content, c.i.f. seaboard

55-60%	$3.35-3.80
60-65%	3.80-3.90

Vanadium Ore

Cents per lb $V_2 O_5$

Domestic	31.00

Refractories

Fire Clay Brick (per 1000)

High-Heat Duty: Ashland, Grahn, Hayward, Hitchins, Haldeman, Olive Hill, Ky., Athens, Troup, Tex., Beech Creek, Clearfield, Curwensville, Lock Haven, Lumber, Orviston, West Decatur, Pa., Bessemer, Ala., Farber, Mexico, St. Louis, Vandalia, Mo., Ironton, Oak Hill, Parral, Portsmouth, O., Ottawa, Ill., Stevens Pottery, Ga., $128; Salina, Pa., $133; Niles, O., $138; Cutler, Utah, $148.

Super-Duty: Ironton, O., Vandalia, Mo., Olive Hill, Ky., Clearfield, Salina, Pa., New Savage, Md., St. Louis, $165; Stevens Pottery, Ga., $175.

Silica Brick (per 1000)

Standard: Alexandria, Claysburg, Mt. Union, Sproul, Pa., Ensley, Ala., Pt. Matilda, Pa., Portsmouth, O., Hawstone, Pa., $140; Warren, Niles, Windham, O., Hays, Latrobe, Morrisville, Pa., $145; E. Chicago, Ind., Joliet, Rockdale, Ill., $150; Lehigh, Utah, $165; Los Angeles, $170.

Super-Duty: Hays, Sproul, Hawstone, Pa., Niles, Warren, Windham, O., Leslie, Md., Athens, Tex., $157; Morrisville, Latrobe, Pa., $160; Curtner, Calif., $182.

Semisilica Brick (per 1000)

Clearfield, Pa., $145; Woodbridge, N. J., $128; Philadelphia, $130.

Ladle Brick (per 1000)

Dry Pressed: Alsey, Ill., Chester, New Cumberland, W. Va., Freeport, Johnstown, Merrill Station, Vanport, Pa., Mexico, Vandalia, Mo., Wellsville, Irondale, New Salisbury, O., $96; Clearfield, Pa., Portsmouth, O., $98.

High-Alumina Brick (per 1000)

50 *Per Cent:* St. Louis, Mexico, Vandalia, Mo., $220; Danville, Ill., $223; Philadelphia, Clearfield, Pa., $230.

Dolomite (per net ton)

Domestic, dead-burned, bulk, Billmeyer, Blue Bell, Williams, Plymouth Meeting, York, Pa., Millville, W. Va., Bettsville, Millersville, Martin, Woodville, O., Gibsonburg, Narlo, O., $16; Thornton, McCook, Ill., $16.35; Dolly Siding, Bonne Terre, Mo., $15.

Magnesite (per net ton)

Domestic, dead-burned, bulk ½-in. grains with fines: Chewelah, Wash., Luning, Nev. $43; ⅜-in. grains with fines: Baltimore, $69.40.

Sleeves (per 1000)

Reesdale, Johnstown, Bridgeburg, Pa., St. Louis, $177; Clearfield, Pa., $189.

Metallurgical Coke

Price per net ton

Beehive Ovens

Connellsville, furnace	$14.50-15.50
Connellsville, foundry	17.50-18.50

Oven Foundry Coke

Birmingham, ovens	$27.60
Cincinnati, deld.	32.53
Buffalo, ovens	29.50
Camden, N.J., ovens	28.50
Detroit, ovens	29.50
Pontiac, deld.	31.15
Saginaw, deld.	32.73
Erie, Pa. ovens	29.50
Everett, Mass., ovens New England, deld.	30.55*
Indianapolis, ovens	28.75
Ironton, O., ovens	28.00
Cincinnati, deld.	28.25
Kearny, N.J., ovens	29.00
Lone Star, Tex., ovens	25.50
Milwaukee, ovens	29.50
Painesville, O., ovens	29.50
Cleveland, deld.	31.55
Philadelphia, ovens	28.50
St. Louis, ovens	30.50
Neville Island (Pittsburgh), Pa., ovens	28.25
St. Paul, ovens	28.50
Chicago, deld.	31.82
Swedeland, Pa., ovens	28.50
Terre Haute, Ind., ovens	28.75

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*Or within $4.55 freight zone from works.

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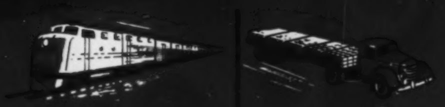
Ladle Brick



Line your iron and steel ladles with Goose Lake Fire Clay Ladle Brick! Produced by the dry press method with a special deairing process, Goose Lake Brick assures excellent resistance to basic slags, spalling and abrasion. It is well burned to provide high density, low porosity and uniform dimensions.

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IMPORT & EXPORT — **LIVINGSTON & SOUTHARD, INC.** *99 Park Ave., New York, N. Y.* • *Cable Address:* **FORENTRACO**

1957 Scrap Volume Seen Holding

Trade authority thinks year's total may be a shade less than that in 1956. Some 41 million tons of purchased material were handled last year, up 2 million from 1955

Scrap Prices, Page 508

Scrap generated and consumed in 1956 about equaled the 1955 volume, says Edwin C. Barringer, executive vice president, Institute of Scrap Iron & Steel Inc.

He thinks 1957 volume may be about the same, possibly a shade less, than it was in 1956. The last half of the year, he says, may fall behind the first half pace.

Some 41 million gross tons of purchased scrap were handled during the year, up about 2 million tons from 1955. Of the total, 36 million tons went to domestic mills and foundries, and 5 million tons were exported.

Home scrap amounted to a little less than 37 million tons. So total consumption of scrap was between 72.5 and 73 million gross tons, about the same as it was in 1955.

Industrial scrap amounted to 12 million tons.

Hydraulic compressed bundles are now the leading obsolescent grade, reflecting increased production of light, flat-rolled steel products. Also, auto wrecking yards are providing more bodies and light iron for compression into No. 2 bundles. It is estimated the auto yards provided 6.5 million tons.

The railroads sold about 4.2 million tons of scrap, a half million tons more than in 1955. Farm scrap accounted for 3 million tons. Other sources, including detinning operations, government installations, tin cans shredded for use in copper precipitation and shipbuilding, totaled about 14.8 million tons of obsolescent scrap.

Pittsburgh—An independent mill entered the market twice during the past week, buying No. 1 heavy melting at $64 and later at $63 a ton. It also purchased No. 2 heavy melting for $55.

Philadelphia—Scrap sellers anticipate a fairly steady market for the present, with accumulation of tonnage for export imparting strength to the situation.

New York — While the major open-hearth grades of scrap are unchanged, a generally strong undertone prevails in the market.

Cleveland—A noticeably easier tone has developed in the scrap market here, largely due to lower prices prevailing on auto lists, principally in the Detroit area where prices on production scrap are off $4 to $5 a ton. Dealer grades have not been affected too much as yet, prices being off about $1.50 a ton on the steelmaking grades. In the Valley the market is holding at $66-$67 for No. 1.

Detroit — December auto lists involved an estimated 100,000 tons, largest in months. Successful bids depressed list prices about $3 or $4.

Chicago—A quiet scrap market prevailed at the start of the new year with prices unchanged from the last week in December. Buying was at a minimum.

Boston — Brokers were paying $51.50-$52.00, shipping point, for No. 1 heavy melting steel during the closing days of the old year.

Birmingham—The scrap market in this area was at a virtual standstill over the holidays.

St. Louis—With more scrap appearing on the market, brokers' buying prices have skidded further, noticeably on rail scrap.

Seattle—Activity was restricted in the scrap market over the holidays. Prices are firm.

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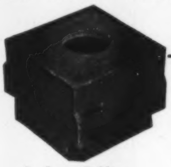

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ESTABLISHED 1871

Iron and Steel Scrap

Consumer prices, per gross ton, except as otherwise noted, including broker's commission, as reported to STEEL. *Changes shown in italics.*

STEELMAKING SCRAP COMPOSITE

Jan. 2	$63.17
Dec. 26	64.50
Dec. Avg.	64.29
Jan. 1956	52.17
Jan. 1952	43.00

Based on No. 1 heavy melting grade at Pittsburgh, Chicago and eastern Pennsylvania.

PITTSBURGH

No. 1 heavy melting	*62.00-63.00*
No. 2 heavy melting	*54.00-55.00*
No. 1 bundles	*62.00-63.00*
No. 2 bundles	*49.00-50.00*
No. 1 busheling	*62.00-63.00*
Machine shop turnings	*42.00-43.00*
Mixed borings, turnings	*42.00-43.00*
Short shovel turnings	*46.00-47.00*
Cast iron borings	*46.00-47.00*
Cut structurals, 3 ft. lengths	*72.00-73.00*
Heavy turnings	59.00-60.00
Punchings & plate scrap	*72.00-73.00*
Electric furnace bundles	*72.00-73.00*

Cast Iron Grades

No. 1 cupola	54.00-55.00
Heavy breakable cast	52.00-53.00
Unstripped motor blocks	40.00-41.00
No. 1 machinery cast	61.00-62.00

Railroad Scrap

No. 1 R.R. heavy melt.	71.00-72.00
Rails, 2 ft and under	81.00-82.00
Rails, 18 in. and under	82.00-83.00
Rails, random lengths	79.00-80.00
Railroad specialties	75.00-76.00

Stainless Steel Scrap

18-8 bundles & solids	480.00-520.00
18-8 turnings	400.00-420.00
430 bundles & solids	110.00-120.00
430 turnings	80.00-85.00

CLEVELAND

No. 1 heavy melting	*63.00-64.00*
No. 2 heavy melting	*54.00-55.00*
No. 1 bundles	*63.00-64.00*
No. 2 bundles	44.00-45.00
No. 1 busheling	*63.00-64.00*
Machine shop turnings	35.00-36.00
Mixed borings, turnings	38.00-39.00
Short shovel turnings	38.00-39.00
Cast iron borings	38.00-39.00
Cut foundry steel	*61.00-62.00*
Low phos.	*64.00-65.00*
Cut structural plates 2 ft and under	*69.00-70.00*
Alloy free, short shovel turnings	43.00-44.00
Electric furnace bundles	*64.00-65.00*

Cast Iron Grades

No. 1 cupola	59.00-60.00
Charging box cast	*51.00-52.00*
Heavy breakable cast	*49.00-50.00*
Stove plate	55.00-56.00
Unstripped motor blocks	*38.00-39.00*
Brake shoes	47.00-48.00
Clean auto cast	57.00-58.00
Burnt cast	44.00-45.00
Drop broken machinery	60.00-61.00

Railroad Scrap

No. 1 R.R. heavy melt.	*67.00-68.00*
R.R. malleable	71.00-72.00
Rails, 2 ft and under	86.00-87.00
Rails, 18 in. and under	87.00-88.00
Rails, random lengths	83.00-84.00
Cast steel	71.00-72.00
Railroad specialties	77.00-78.00
Uncut tires	76.00-77.00
Angles, splice bars	78.00-79.00
Rails, rerolling	85.00-86.00

Stainless Steel

(Brokers' buying prices; f.o.b. shipping point)

18-8 bundles, solids	450.00-500.00
18-8 turnings	300.00-310.00
430 clips, bundles, solids	115.00-120.00
430 turnings	55.00-65.00

YOUNGSTOWN

No. 1 heavy melting	66.00-67.00
No. 2 heavy melting	57.00-58.00
No. 1 bundles	66.00-67.00
No. 2 bundles	49.00-50.00
No. 1 busheling	66.00-67.00
Machine shop turnings	36.00-37.00
Short shovel turnings	43.00-44.00
Cast iron borings	43.00-44.00
Low phos.	*67.00-68.00*
Electric furnace bundles	*67.00-68.00*

Railroad Scrap

No. 1 R.R. heavy melt.	*68.00-69.00*

CHICAGO

No. 1 heavy melting	62.00-66.00
No. 2 heavy melting	50.00-52.00
No. 1 factory bundles	67.00-69.00
No. 1 dealer bundles	61.00-62.00
No. 2 bundles	45.00-47.00
No. 1 busheling	64.00-66.00
Machine shop turnings	39.00-40.00
Mixed borings, turnings	41.00-42.00
Short shovel turnings	41.00-42.00
Cast iron borings	41.00-42.00
Cut structurals, 3 ft	70.00-71.00
Punchings & plate scrap	71.00-72.00

Cast Iron Grades

No. 1 cupola	50.00-51.00
Stove plate	46.00-47.00
Unstripped motor blocks	39.00-40.00
Clean auto cast	55.00-56.00
Drop broken machinery	55.00-56.00

Railroad Scrap

No. 1 R.R. heavy melt.	69.00-70.00
R.R. malleable	70.00-71.00
Rails, 2 ft and under	86.00-87.00
Rails, 18 in. and under	87.00-88.00
Angles, splice bars	77.00-78.00
Rails, rerolling	89.00-90.00

Stainless Steel Scrap

18-8 bundles & solids	505.00-515.00
18-8 turnings	355.00-375.00
430 bundles & solids	105.00-110.00
430 turnings	60.00-65.00

DETROIT

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	*54.00*
No. 2 heavy melting	*47.00*
No. 1 bundles	*55.00*
No. 2 bundles	*38.00*
No. 1 busheling	*54.00*
Machine shop turnings	*30.00*
Mixed borings, turnings	*32.00*
Short shovel turnings	*33.00*
Punchings & plate scrap	*63.50*

Cast Iron Grades

No. 1 cupola	49.00
Charging box cast	43.00
Stove plate	45.00
Heavy breakable	44.00
Unstripped motor blocks	32.00
Clean auto cast	54.00
Malleable	54.00

ST. LOUIS

(Brokers' buying prices)

No. 1 heavy melting	56.00
No. 2 heavy melting	47.50
No. 1 bundles	56.00
No. 2 bundles	44.00
No. 1 busheling	56.00
Machine shop turnings	36.00
Short shovel turnings	38.50

Cast Iron Grades

No. 1 cupola	50.00
Charging box cast	45.50
Heavy breakable cast	45.50
Unstripped motor blocks	45.50
Brake shoes	51.00
Clean auto cast	53.00
Stove plate	43.00

Railroad Scrap

No. 1 R.R. heavy melt.	66.00
Rails, 18 in. and under	85.00
Rails, rerolling	86.00
Rails, random lengths	80.00
Angles, splice bars	70.00

PHILADELPHIA

No. 1 heavy melting	63.00
No. 2 heavy melting	54.00-56.00
No. 1 bundles	63.00
No. 2 bundles	52.00-54.00
No. 1 busheling	63.00
Electric furnace bundles	65.00-66.00
Mixed borings, turnings	45.00-46.00
Machine shop turnings	45.00-46.00
Short shovel turnings	49.00
Heavy turnings	58.00-59.00
Structurals & plates	68.00-70.00
Couplers, springs, wheels	74.00
Rails, crops, 2 ft & under	82.00-83.00

Cast Iron Grades

No. 1 cupola	54.00-56.00
Malleable	68.00
Heavy breakable cast	59.00
Drop broken machinery	60.00-61.00

NEW YORK

(Brokers' buying prices)

No. 1 heavy melting	58.00
No. 2 heavy melting	48.00-49.00
No. 1 bundles	58.00
No. 2 bundles	46.00-47.00
Machine shop turnings	36.00-37.00
Mixed borings, turnings	*36.00-37.00*
Short shovel turnings	41.00-41.50
Low phos. (structural & plate)	59.00-60.00

Cast Iron Grades

No. 1 cupola	46.00-47.00
Unstripped motor blocks	38.00-39.00
Heavy breakable	*50.50-51.50*

Stainless Steel

18-8 sheets, clips, solids	475.00-485.00
18-8 borings, turnings	335.00-360.00
430 sheets, clips, solids	110.00-115.00
410 sheets, clips, solids	100.00-105.00

BOSTON

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	51.50-52.00
No. 2 heavy melting	41.00-41.50
No. 1 bundles	51.50-52.00
No. 2 bundles	40.50-41.00
No. 1 busheling	51.50-52.00
Machine shop turnings	33.50-34.00
Mixed borings, turnings	34.00-34.50
Short shovel turnings	37.50-38.00
No. 1 cast	44.50-45.50
Mixed cupola cast	42.00-43.00
No. 1 machinery cast	45.00-46.00

BUFFALO

No. 1 heavy melting	62.00-63.00
No. 2 heavy melting	52.00-53.00
No. 1 bundles	62.00-63.00
No. 2 bundles	48.00-49.00
No. 1 busheling	62.00-63.00
Mixed borings, turnings	38.00-39.00
Machine shop turnings	39.00-40.00
Short shovel turnings	43.00-44.00
Cast iron borings	34.00-35.00
Low phos.	65.00-66.00

Cast Iron Grades

(F.o.b. shipping point)

No. 1 cupola	49.00-50.00
No. 1 machinery	54.00-55.00

Railroad Scrap

Rails, random lengths	71.00-72.00
Rails, 3 ft and under	77.00-78.00
Railroad specialties	70.00-71.00

CINCINNATI

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	*61.00-62.00*
No. 2 heavy melting	*51.00-52.00*
No. 1 bundles	*61.00-62.00*
No. 2 bundles	*45.00-46.00*
No. 1 busheling	*61.00-62.00*
Machine shop turnings	*40.50-41.50*
Mixed borings, turnings	*38.50-39.50*
Short shovel turnings	*42.50-43.50*
Cast iron borings	*38.50-39.50*
Low phos. 18 in.	*67.00-68.00*

Cast Iron Grades

No. 1 cupola	48.00-49.00
Heavy breakable cast	47.00-48.00
Charging box cast	48.00-49.00
Drop broken machinery	59.00-60.00

Railroad Scrap

No. 1 R.R. heavy melt.	*63.00-64.00*
Rails, 18 in. and under	82.00-83.00
Rails, random lenghts	74.00-75.00

BIRMINGHAM

No. 1 heavy melting	46.00-47.00
No. 2 heavy melting	44.00-45.00
No. 1 bundles	46.00-47.00
No. 2 bundles	38.00-39.00
No. 1 busheling	46.00-47.00
Cast iron borings	27.00-28.00
Short shovel turnings	40.00-41.00
Machine shop turnings	39.00-40.00
Bar crops and plate	64.00-65.00
Structurals & plate, 2 ft.	63.00-64.00
Electric furnace bundles	56.00-57.00
Cut foundry steel	54.00-55.00

Cast Iron Grades

(F.o.b. shipping point)

No. 1 cupola	52.00-53.00
Stove plate	51.00-52.00
Unstripped motor blocks	44.00-45.00
Charging box cast	40.00-41.00
No. 1 wheels	45.00-46.00

Railroad Scrap

No. 1 R.R. heavy melt.	63.00-64.00
Rails, 18-in. and under	76.00-77.00
Rails, rerolling	82.00-83.00
Rails, random lengths	76.00-77.00
Angles, splice bars	68.00-69.00

SEATTLE

No. 1 heavy melting	54.00
No. 2 heavy melting	51.00
No. 1 bundles	51.00
No. 2 bundles	31.00
Machine shop turnings	28.00-30.00
Mixed borings, turnings	28.00-30.00
Electric furnace No. 1	62.00-65.00

Cast Iron Grades

No. 1 cupola	54.00-56.00
Heavy breakable cast	46.00
Unstripped motor blocks	48.00-50.00
Stove plate (f.o.b. plant)	40.00-42.00

LOS ANGELES

No. 1 heavy melting	55.00
No. 2 heavy melting	54.00
No. 1 bundles	54.00
No. 2 bundles	47.00
Machine shop turnings	32.00

Cast Iron Grades

(F.o.b. shipping point)

No. 1 cupola	62.00

SAN FRANCISCO

No. 1 heavy melting	55.00
No. 2 heavy melting	52.00
No. 1 bundles	54.00
No. 2 bundles	40.00
Machine shop turnings	35.00
Mixed borings, turnings	35.00
Cast iron borings	35.00
Heavy turnings	35.00
Short shovel turnings	38.00
Cut structurals	62.00

Cast Iron Grades

No. 1 cupola	57.00
Charging box cast	45.00-47.00
Stove plate	48.00
Heavy breakable cast	42.00
Unstripped motor blocks	50.00
Clean auto cast	57.00
No. 1 wheels	48.00
Drop broken machinery	60.00

HAMILTON, ONT.

No. 1 heavy melting	54.00
No. 2 heavy melting	47.00
No. 1 bundles	54.00
No. 2 bundles	40.50
Mixed steel scrap	46.00
Busheling, new factory:	
Prepared	52.00
Unprepared	48.00
Short steel turnings	35.00

Cast Iron Grades†

No. 1 machinery cast	50.00

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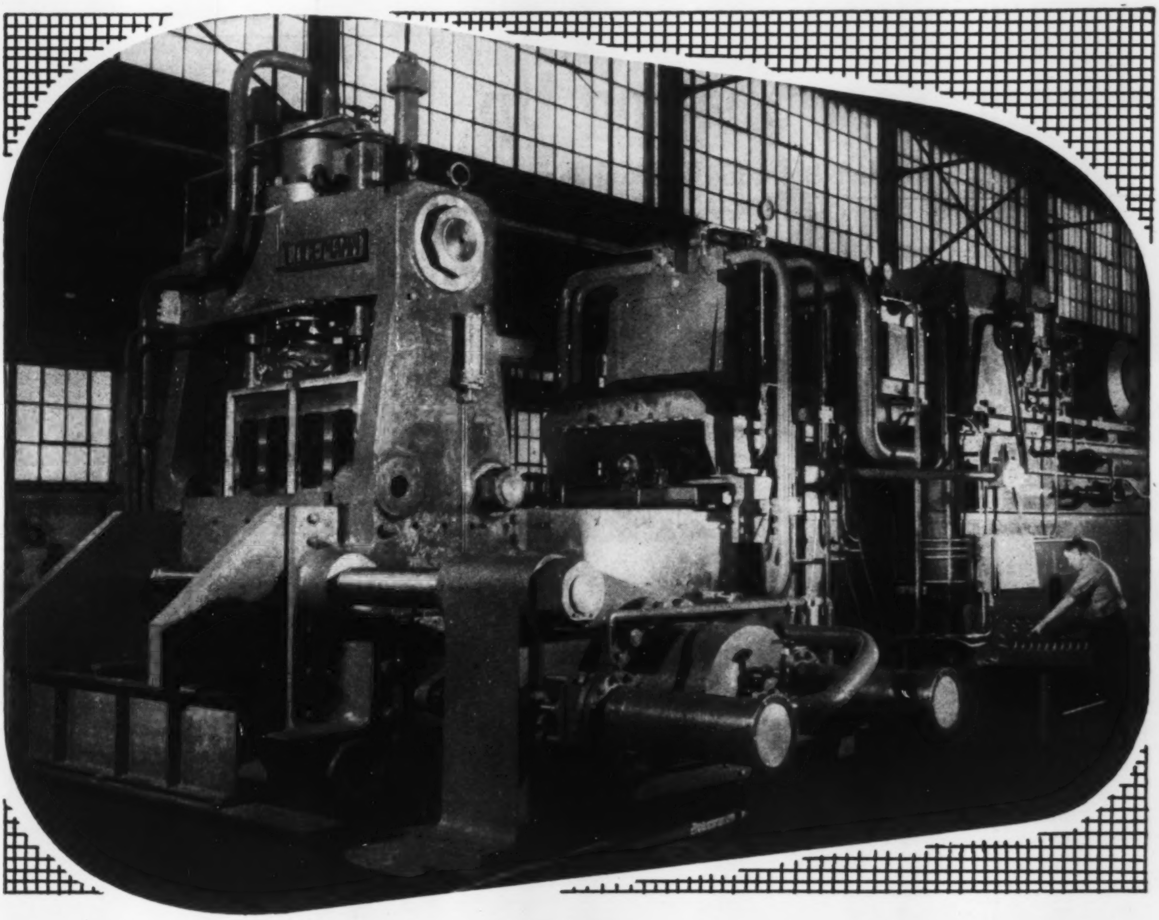
†F.o.b., Hamilton, Ont.



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Banner Year Shaping Up

This will be a competitive but good year for the nonferrous industry. Copper, aluminum, lead, zinc, magnesium, titanium and nickel may set production records

Nonferrous Metal Prices, Pages 512 & 513

NONFERROUS metal producers are quietly confident. Most will set production records in 1957. All will be out for a bigger share of the metals market.

Aluminum—Total available U.S. supply will be about 2.5 million tons this year. Some 2.3 million tons were available from all sources (primary production, secondary recovery, imports) during '56. U.S. production this year will top last year's record total of about 1.68 million tons. U.S. rated capacity on Jan. 1 was 1,775,500 tons. By Jan. 1, 1958, it should reach 2,152,500 tons. Aluminum producers will go all out during 1957 to saturate existing markets so that supply will not outstrip demand by more than 3 to 5 per cent. The first half of this year could be an indicator of what may happen to the aluminum industry during the next three to five years.

Copper—Most producers contend that 1956 was a shakeout year for the red metal. Gyrating prices, caused by high level demand followed by a sudden fall-off in orders, had primary and secondary copper men hard pressed to establish a realistic price. First quarter results should show substantial improvement for red metal producers. Last year will still go down as a peak year.

Supply is slated for an increase during the year, and three-year labor contracts give some assurance of uninterrupted production. Copper's three largest markets (power line, electrical equipment and construction) should be at peak levels. The automotive and appliance industries hold the key to a solid year for the industry. Free world copper capacity will be more than 3 million tons in '57. World production will be dependent on political climate, world economic outlook and the success of the three-year labor contracts in the U.S.

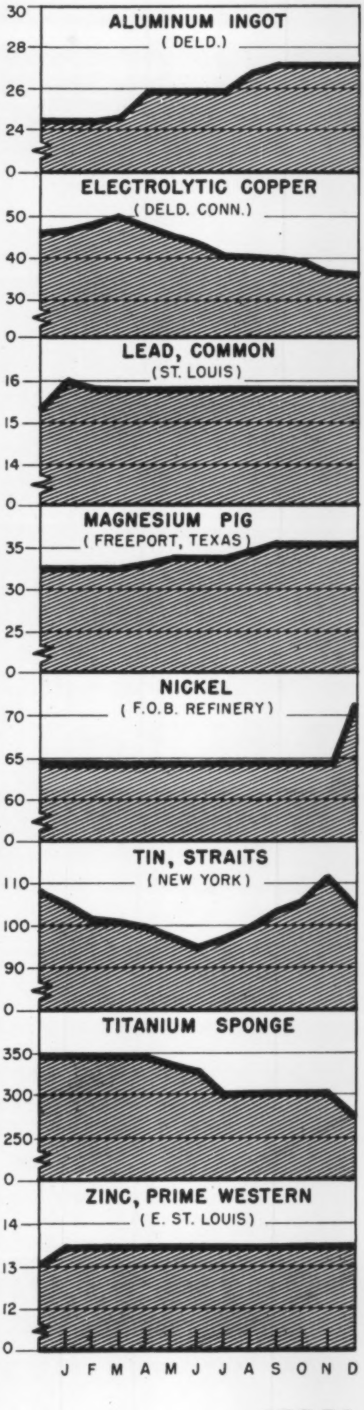
Zinc—Domestic slab zinc shipments will be out to break the 1955 record of 1,007,619 tons. If this happens, it means the 1955 record for shipments to the diecasting (405,000 tons) and galvanizing (439,000 tons) industries will be broken, too. Some of the trends pointing to a record year: 1. Industry spokesmen estimate that an average of 65 lb is going into each 1957 model car. 2. The U.S. will continue to develop means of draining off excess foreign zinc via the Agriculture department's barter program. 3. General Services Administration may continue to purchase zinc for long-range strategic stockpile even though its initial goal (300,000 tons) has almost been reached. 4. Zinc galvanizers and diecasters are developing a bullish attitude as the year gets under way.

Lead—Total U.S. lead consumption reached about 1,190,000 tons in '56. During 1955, some 1,205,700 tons were consumed. Last year stacks up as a peak year for most lead uses. The tetraethyl lead industry used an estimated 193,000 tons last year, up from about 165,000 tons in 1955. Lead for cable rose from 121,000 tons in '55 to 134,000 tons in '56. Battery consumption dropped from 375,000 tons in '55 to 365,000 tons in '56. Replacement batteries showed an increase but could not make up for the loss of new equipment sales to motordom. Industry observers estimate that the Agriculture department, under the barter program, purchased 40,000 to 50,000 tons of foreign lead ores and metal. General Services Administration contracted for about 60,000 tons during the year for supplementary stockpile. With the government's help, total use of lead in the U.S. during the coming year could top 1.2 million tons.

Tin—The U.S. Texas City tin smelter will close on the last day of this month. It means that some 23,000 tons of tin, which had been going to the stockpile, will find

How Prices Went in '56

(Cents per pound)



their way to world markets. The additional tonnage should stabilize the market at about the 95 cent a pound mark. Demand will be good throughout '57.

Titanium—Military demand continues to mushroom. With each price drop, civilian interest grows. Technological breakthroughs in rolling, forging and stamping of titanium will help stimulate this civilian market. Mill product shipments totaled about 5300 tons in 1956. Look for the total to jump to 11,500 tons this year. Sponge production will be between 25,000 and 28,000 tons.

Magnesium—Primary production just touched 68,000 tons in 1956. Strikes kept the industry from nearing its capacity of 75,000 tons. By the end of this year, Brooks & Perkins Inc. will be the second primary producer. Annual capacity will be 10,000 tons. This will be a year of more experimenting by military and civilian users and potential users. Some of the biggest potential markets may not develop until there is at least one alternate source of magnesium supply. Demand from the material handling equipment makers and the electronics industry will expand in '57. Use of mag as an alloying and reduction agent will parallel the growth in aluminum, zirconium, titanium and other nonferrous metals.

Nickel — Free world production was 215,000 tons in 1955. Last year an estimated 218,000 tons were produced. Earlier in '56, industry observers had predicted the total would be nearer 222,000 tons. The U.S. receives about two-thirds of the free world production.

The coming year will see little help for civilian users of nickel. Even with stockpile calls deferred during the first quarter, defense demand for military rated orders will take up most of any extra tonnage made available.

Prices — The trend is toward greater stability in prices in 1957. While most metals were more expensive at the end of 1956 than a year before, some—notably copper, tin and titanium—were below year-ago levels. Labor peace and balance between supply and demand will prevent price hikes in most cases. Technological advances may bring some down.

TRADE-MARKS WHICH IDENTIFY THE ORIGINAL AND THE BEST

"PHOSPHOR BRONZE."® *Phosphor Bronze* ®

ELEPHANT BRAND®

A little more than seventy-five years ago a wonderful new kind of copper and tin alloy possessing high tensile strength, great resiliency and unusual corrosion-resistant properties was introduced to American industry. This new bronze alloy had been perfected by the addition of a small amount of phosphorus to the copper and tin mixture.

No other producer of metals in the United States was able to duplicate this extraordinarily useful alloy. Therefore, because of the uniqueness of this new phosphorus-bearing *alloy*, the smelters responsible for its creation gave it a trade name "PHOSPHOR BRONZE" and adopted for itself the firm name of The Phosphor Bronze Smelting Company.

This was the first Phosphor Bronze ever produced in the United States of America.

"Phosphor Bronze" was immediately accepted by America's burgeoning industry. Demand for the new alloy grew by leaps and bounds and The Phosphor Bronze Smelting Company soon had many imitations of its products. So, to protect customers from spurious imitations, the trade name of "Phosphor Bronze" was incorporated into two distinctive *trade-marks* which were duly registered in the U. S. Patent Office on February 21, 1888. These trade-mark registrations have been maintained, in full force, throughout the intervening years and are presently owned by The Phosphor Bronze Corporation, successors to the original Phosphor Bronze Smelting Company.

In time, new variations of the original "Phosphor Bronze" alloy were introduced by the now-famous smelting Company. To identify these, the trade name of "ELEPHANT BRAND" was adopted, together with a distinctive picture of an elephant. The words "ELEPHANT BRAND" were incorporated into a *trade-mark* and registered with the U. S. Patent Office on August 20, 1907. The picture of the elephant shown in this advertisement, is a new one, designed to supersede its 1906 predecessor and was Registered, as a *trade-mark,* on October 2, 1956.

We are proud that American industry has wholeheartedly accepted our product. The name "PHOSPHOR BRONZE" has become internationally known and is familiar to metalworking men and metallurgists everywhere.

In view of this unanimous acceptance and usage, we—the officers, stockholders and employees of The Phosphor Bronze Corporation acknowledge the universal use of the name and herewith bequeath it to the American metalworking industries. We reserve only . . . the exclusive right to use the trade-marks illustrated above.

THE PHOSPHOR BRONZE CORPORATION

A Wholly Owned and Operated Subsidiary of The Seymour Manufacturing Company

SEYMOUR, CONNECTICUT

Nonferrous Metals

Cents per pound, carlots except as otherwise noted.

PRIMARY METALS AND ALLOYS

Aluminum: 99+%, ingots 27.10; pigs, 25.00, 10,000 lb or more, f.o.b. shipping point. Freight allowed on 500 lb or more.

Aluminum Alloy: No. 13, 28.90; No. 43, 28.70; No. 195, 30.30; No. 13, 28.90; No. 43, 28.70; 30-lb ingots.

Antimony: R.M.M. brand, 99.5%, 33.00; Lone Star brand, 33.50, f.o.b. Laredo, Tex., in bulk. Foreign brands, 99.5%, 27.50-28.00, New York, duty paid, 10,000 lb or more.

Beryllium: 97%, lump or beads, $71.50 per lb, f.o.b. Cleveland or Reading, Pa.

Beryllium Aluminum: 5% Be, $74.75 per lb of contained Be, with balance as Al at market price, f.o.b. shipping point.

Beryllium Copper: 3.75-4.25% Be, $43 per lb of contained Be, with balance as Cu at market price on shipment date, f.o.b. shipping point.

Bismuth: $2.25 per lb ton lots.

Cadmium: Sticks and bars, $1.70 per lb deld.
Cobalt: 97-99%, $2.60 per lb for 550-lb keg; $2.62 per lb for 100-lb case; $2.67 per lb under 100 lb.

Columbium: Powder, $119.20 per lb, nom.

Copper: Electrolytic, 36.00 deld. Conn. valley; 36.00 deld. Midwest; custom smelters, 35.00 deld.; lake, 36.00 deld.; fire refined, 35.75 deld.

Germanium: First reduction, $201.85-$220 per lb; intrinsic grade, $220-$242.67 per lb, depending on quantity.

Gold: U.S. Treasury, $35 per oz.
Indium: 99.9%, $2.25 per troy oz.
Iridium: $90-$110 nom. per troy oz.
Lead: Common, 15.80; chemical, 15.90; corroding, 15.90, St. Louis. New York basis, add 0.20.

Lithium: 98+%, cups or ingots, $11.50; rod, $13.50; shot or wire, $14.50, f.o.b. Minneapolis, 100 lb lots.

Magnesium: Pig, 35.25; ingot, 36.00, f.o.b. Velasco, Tex. 13 in. sticks, 59.00, f.o.b. Madison, Ill.

Magnesium Alloys: AZ91B (diecasting), 37.25 deld.; AZ63A, AZ92A, AZ91C (sand casting), 40.75, f.o.b. Velasco, Tex.

Mercury: Open market, spot, New York, $255-$257 per 76-lb flask.

Molybdenum: Extruded ingot, $9.60 per pound, f.o.b. Detroit.

Nickel: Electrolytic cathodes, sheets (4 x 4 in. and larger), unpacked, 74.00; 10-lb pigs, unpacked, 78.25; "XX" nickel shot, 79.50; "F" nickel shot or ingots for addition to cast iron, 74.50; prices f.o.b. Port Colborne, Ont., including import duty. New York basis, add 1.01.

Osmium: $80-$100 per troy oz, nom.

Palladium: $23-$24 per troy oz.

Platinum: $103-$106 per troy oz from refineries.

Radium: $16-$21.50 per mg radium content, depending on quantity.

Rhodium: $118-$125 per troy oz.

Ruthenium: $45-$55 per troy oz.

Selenium: 99.5%, $13.50-$15.50 per lb.

Silver: Open market, 91.375 per troy oz.

Sodium: 16.50, c.l.; 17.00, l.c.l.

Tantalum: Sheet, rod, $68.70 per lb; powder, $56.63 per lb.

Tellurium: $1.50-$1.75 per lb.

Thallium: $12.50 per lb.

Tin: Straits, N. Y., spot, 100.75; prompt, 100.625.

Titanium: Sponge, 99.3+%, grade A-1 ductile (0.3% Fe max), $2.75; grade A-2 (0.5% Fe max), $2.50 per pound.

Tungsten: Powder, 98.8%, carbon reduced, 1000-lb lots, $4.20 per lb, nom, f.o.b. shipping point; less than 1000 lb, add 15.00; 99+% hydrogen reduced, $5. Treated ingot, $6.70.

Zinc: Prime Western, 13.50; brass special, 13.75; intermediate, 14.00, East St. Louis, freight allowed over 0.50 per pound. New York basis, add 0.50. High grade, 14.85; special high grade, 15.25 deld. Die casting alloy ingot No. 3, 18.00; No. 2, 19.00; No. 5, 18.50 deld.

Zirconium: Ingots, commercial grade, $14.40 per lb; low-hafnium reactor grade, $28.07. Sponge, commercial grade, $10 per lb; reactor grade, $14-$22 per lb, depending on quantity. Powder electronics grades, $15 per lb; flash grade, $11.50.

(Note: Chromium, manganese and silicon metals are listed in ferroalloy section.)

SECONDARY METALS AND ALLOYS

Aluminum Ingot: Piston alloys, 25.25-30.00; No. 12 foundry alloy (No. 2 grade), 23.50-24.00; 5% silicon alloy, 0.60 Cu max, 26.00-26.25; 13 alloy, 0.60 Cu max, 26.00-26.25; 195 alloy, 26.00-26.50; 108 alloy, 24.00. Steel deoxidizing grades, notch bars, granulated or shot: Grade 1, 23.75; grade 2, 23.00, grade 3, 22.25; grade 4, 21.75.

Brass Ingot: Red brass, No. 115, 35.00; tin bronze, No. 225, 46.00; No. 245, 41.50; high-leaded tin bronze, No. 305, 38.50; No. 1 yellow, No. 405, 27.50; manganese bronze, No. 421, 30.75.

Magnesium Alloy Ingot: AZ63A, 37.50; AZ91B, 37.50; AZ91C, 37.50; AZ92A, 37.50.

NONFERROUS PRODUCTS

BERYLLIUM COPPER

(Base prices per lb, plus mill extras, 2000 to 5000 lb; nominal 1.9% Be alloy). Strip, $1.86-$1.91, f.o.b. Temple, Pa., or Reading, Pa.; rod, bar, wire, $1.88, f.o.b. Temple, Pa.

COPPER WIRE

Bare, soft, f.o.b. eastern mills, 30,000-lb lots, 41.355; l.c.l., 41.98. Weatherproof, 30,000-lb lots, 40.78; l.c.l., 41.58. Magnet wire deld., 15,000 lb or more, 48.68; l.c.l., 49.43.

LEAD

(Prices to jobbers, f.o.b. Buffalo, Cleveland, Pittsburgh) Sheets, full rolls, 140 sq ft or more, $21.50 per cwt; pipe, full coils, $21.50 per cwt; traps and bends, list prices plus 30%.

TITANIUM

(Prices per lb, 10,000 lb and over, f.o.b. mill) Sheet and strip, $11.00-$14.75; sheared mill plate, $9.25-$11.25; wire $8.50-$11.00; forging billets, $6.85-$7.10; hot-rolled and forged bars, $7.10-$7.85.

ZINC

(Prices per lb, c.l., f.o.b. mill) Sheets, 24.00; ribbon zinc in coils, 21.50; plates, 20.00.

ZIRCONIUM

Plate, $20.35; H.R. strip, $23.95; C.R. strip, $32.00; forged or H.R. bars, $18.40; wire, 0.015 in., 8.00c per linear foot.

NICKEL, MONEL, INCONEL

	"A" Nickel	Monel	Inconel
Sheets, C.R.	126	106	128
Strip, C.R.	124	108	138
Plate, H.R.	120	105	121
Rod, Shapes, H.R.	107	89	109
Seamless Tubes	157	129	300

ALUMINUM

Sheet and Circles: 1100 and 3003 mill finish (30,000 lb base; freight allowed)

Thickness Range, Inches	Flat Sheet	Coiled Sheet
0.249-0.138	40.90-45.40	....
0.135-0.096	41.40-46.50	37.70-39.60
0.095-0.077	42.10-48.30	37.80-39.80
0.076-0.061	42.70-50.60	38.20-40.50
0.060-0.048	43.40-52.90	38.80-41.50
0.047-0.038	43.90-55.60	38.60-42.90
0.037-0.030	44.30-50.00	40.40-44.70
0.029-0.024	44.90-52.40	41.00
0.023-0.019	45.80-52.20	42.00
0.018-0.017	46.60-53.30	42.60
0.016-0.015	47.50-53.90	43.40
0.014	48.50-50.90	44.40
0.013-0.012	49.70-52.10	45.10
0.011	50.70-53.70	46.30
0.010-0.0095	52.10-54.40	47.60
0.009-0.0085	53.40	49.10
0.008-0.0075	55.00	50.03
0.007	56.50	51.80
0.006	58.10	53.20

ALUMINUM (continued)

Plates and Circles: Thickness 0.250-3 in., 24-60 in. width or diam, 72-240 in. lengths.

Alloy	Plate Base	Circle Base
1100-F, 3003-F	40.2	44.5
5050-F	41.3	45.6
3004-F	42.3	47.5
5052-F	42.9	48.2
6061-T6	44.4	50.0
2024-T4*	48.1	54.4
7075-T6*	55.4	62.5

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*24-48 in. widths or diam, 72-180 lengths.

Screw Machine Stock: 30,000 lb base.

Diam. (in.) or across flats	Round 2011-T3	Round 2017-T4	Hexagonal 2011-T3	Hexagonal 2017-T4
Drawn				
0.125	74.30	71.50	....	....
0.156-0.172	63.00	60.40	....	....
0.188	63.00	60.40	....	76.40
0.219-0.234	59.70	57.20	....	....
0.250-0.281	59.70	57.20	....	72.00
0.313	59.70	57.20	....	69.00
0.344	58.50	....	....	....
Cold-finished				
0.375-0.547	58.80	57.50	70.10	65.50
0.563-0.688	58.80	57.50	66.70	61.60
0.750-1.000	57.40	56.00	61.00	58.10
1.063	57.40	56.00	....	56.10
1.125-1.500	55.20	53.90	59.00	56.10
Rolled				
1.563	53.70	52.40	....	....
1.625-2.000	53.10	51.60	....	....
2.125-2.500	51.70	50.80	....	....
2.563-3.375	50.20	48.70	....	....

Forging Stock: Round, Class 1, 43.30-55.90 in specific lengths 36-144 in., diameters 0.375-8 in. Rectangles and squares, Class 1, 48.10-63.20 in random lengths, 0.375-4 in. thick width 0.750-10 in.

Pipe: ASA schedule 40, alloy 6063-T6, standard lengths, plain ends, 90,000-lb base, per 100 ft.

Nom. Pipe Size (in.)		Nom. Pipe Size (in.)	
¾	$18.45	2	$ 57.00
1	29.00	4	157.20
1¼	39.25	6	281.65
1½	46.95	8	423.80

Extruded Solid Shapes:

Factor	Alloy 6063-T5	Alloy 6062-T6
9-11	45.90-47.50	61.50-65.80
12-14	46.20-47.70	62.20-66.80
15-17	46.40-48.30	63.50-68.50
18-20	47.00-48.80	65.50-71.10

MAGNESIUM

Sheet and Plate: AZ31B standard grade, 0.32 in., 103.10; .081 in., 77.90; .125 in., 70.40; .188 in., 69.00; .250-2.0 in., 67.90. AZ31B spec. grade, .032 in., 171.30; .081 in., 108.70; .125 in., 98.10; .188 in., 95.70; .250-2.0, 93.30. Thread plate, .188 in., 71.70; .250-2.0 in., 70.60; Tooling plate, .250-3.0 in., 73.00.
Extruded Solid Shapes:

Factor	Com. Grade (AZ31C)	Spec. Grade (AZ31B)
6-8	69.60-72.40	84.60-87.40
12-14	70.70-73.00	85.70-88.00
24-26	75.60-76.30	90.60-91.30
36-38	89.20-90.30	104.20-105.30

NONFERROUS SCRAP

DEALER'S BUYING PRICES

(Cents per pound, New York, in ton lots)

Aluminum: 1100 clippings, 14.00-14.50; old sheets, 11.00-11.50; borings and turnings, 7.50-

BRASS MILL PRICES

	MILL PRODUCTS a				SCRAP ALLOWANCES f		
	Sheet, Strip, Plate	Rod	Wire	Seamless Tube	Clean Heavy	Rod Ends	Clean Turnings
Copper	58.13b	55.36c	....	58.32	32.000	32.000	31.250
Yellow Brass	50.19	40.17d	50.73	53.10	24.625	24.375	22.625
Low Brass, 80%	53.40	53.34	53.94	56.21	27.375	27.125	26.625
Red Brass, 85%	54.54	54.48	55.08	57.35	28.500	28.250	27.750
Com. Bronze, 90%	56.23	56.17	56.77	58.79	29.500	29.250	28.750
Manganese Bronze	57.88	51.98	62.22	....	23.000	22.750	22.250
Muntz Metal	52.19	48.00	....	....	23.125	22.875	22.375
Naval Brass	54.14	48.45	61.20	57.55	23.000	22.750	22.250
Silicon Bronze	62.44	61.63	62.48	64.61	31.250	31.000	30.250
Nickel Silver, 10%	66.66	68.99g	68.99	....	30.875	30.675	15.438
Phos. Bronze, A 5%	77.25	77.75	77.75	79.18	33.000	32.750	31.750

a. Cents per lb, f.o.b. mill; freight allowed on 500 lb or more. b. Hot-rolled. c. Cold-drawn. d. Free cutting. e. 3% silicon. f. Prices in cents per lb for less than 20,000 lb, fo.b. shipping point. On lots over 20,000 lb at one time, of any or all kinds of scrap, add 1 cent per lb. g. Leaded

8.00; crankcases, 11.00-11.50; industrial castings, 11.00-11.50.

Copper and Brass: No. 1 heavy copper and wire, 27.00-27.50; No. 2 heavy copper and wire, 25.50-26.00; light copper, 23.00-23.50; No. 1 composition red brass, 24.00-24.50; No. 1 composition turnings, 23.00-23.50; yellow brass turnings, 13.00-13.50, new brass clippings, 21.00-21.50; light brass, 14.50-15.00; heavy yellow brass, 16.00-16.50; new brass rod ends, 18.00-18.50; auto radiators, unsweated, 17.50-18.00; cocks and faucets, 18.50-19.00; brass pipe, 19.00-19.50.

Lead: Heavy, 12.50-13.00; battery plates, 7.00-7.25; linotype and stereotype, 13.00-14.00; electrotype, 12.50-13.00; mixed babbitt, 13.00-14.50.

Monel: Clippings, 75.00-90.00; old sheets, 75.00-80.00; turnings, 70.00-80.00; rods, 75.00-90.00.

Nickel: Sheets and clips, 140.00-185.00; rolled anodes, 140.00-185.00; turnings, 125.00-160.00; rod ends, 140.00-185.00.

Zinc: Old zinc, 4.50-5.50; new die-cast scrap, 4.00-4.50; old die-cast scrap, 2.50-3.00.

REFINERS' BUYING PRICES

(Cents per pound, carlots, delivered refinery)

Aluminum: 1100 clippings, 18.75-19.00; 3003 clippings, 18.75-19.00; 6151 clippings, 18.75-19.00; 5052 clippings, 18.25-19.00; 2014 clippings, 18.00-18.25; 2017 clippings, 18.00-18.25; 2024 clippings, 18.00-18.25; mixed clippings, 17.25-18.00; old sheets, 15.75-16.50; old cast, 15.75-16.25; clean old cable (free of steel), 17.75-19.00; borings and turnings, 15.50-17.00.

Beryllium Copper: Heavy scrap, 0.020-in. and heavier, not less than 1.5% Be, 58.00; light scrap, 54.00; turnings and borings, 38.00.

Copper and Brass: No. 1 heavy copper and wire, 30.25; No. 2 heavy copper and wire, 28.75; light copper, 29.50; refinery brass (60% copper) per dry copper content, 27.25.

INGOTMAKERS' BUYING PRICES

(Cents per pound, carlots, delivered)

Copper and Brass: No. 1 heavy copper and wire, 30.25; No. 2 heavy copper and wire, 28.75; light copper, 26.50; No. 1 composition borings, 27.00; No. 1 composition solids, 27.50; heavy yellow brass solids, 19.00; yellow brass turnings, 18.00; radiators, 21.50.

PLATING MATERIAL

(F.o.b. shipping point, freight allowed on quantities)

ANODES

Cadmium: Special or patented shapes, $1.70 per lb.

Copper: Flat-rolled, 54.79; oval 53.92, 5000-10,000 lb; electrodeposited, 45.78; 2000-5000 lb lots; cast, 48.04, 5000-10,000 lb quantities.

Nickel: Depolarized, less than 100 lb, $1.015; 100-499 lb, 99.50; 500-4999 lb, 95.50; 5000-29,999 lb, 93.50; 30,000 lb, 91.50. Carbonized, deduct 3 cents a lb.

Tin: Bar or slab; less than 200 lb, 119.50; 200-499 lb, 118.00; 500-999 lb, 117.50; 1000 lb or more, 117.00.

Zinc: Balls, 21.00; flat tops, 21.00; flats, 22.75; ovals, 22.00, ton lots.

CHEMICALS

Cadmium Oxide: $1.70 per lb, in 100-lb drums.

Chromic Acid: Less than 10,000 lb, 30.25, over 10,000 lb, 29.50.

Copper Cyanide: 100-1000 lb, 80.50.

Copper Sulphate: 500-1900 lb, 21.15; 2000 lb and over, 18.65.

Nickel Chloride: 10 lb, 46.50; 200 lb, 44.50; 300 lb, 43.50; 400-4900 lb, 41.50; 5000-9900 lb, 39.50; 10,000 lb and over, 38.50. Prices eastern delivery.

Nickel Sulphate: 100 lb, 38.25; 200 lb, 36.25; 300 lb, 35.25; 400-4900 lb, 33.25; 5000-35,900 lb, 31.25; 36,000 lb, 30.25. Prices eastern delivery.

Sodium Cyanide: Egg, under 1000 lb, 19.80; 1000-19,900 lb, 18.80; 20,000 lb and over, 17.80; granular, add 1-cent premium to above.

Sodium Stannate: Less than 100 lb, 71.90; 100-600 lb, 63.40; 700-1900 lb, 60.90; 2000-9900 lb, 59.20; 10,000 lb or more, 58.00.

Stannous Chloride (anhydrous): Less than 25 lb, 169.00; 25 lb, 134.00; 100 lb, 119.00; 400 lb, 116.50; 5200-19,600 lb, 104.30; 20,000 lb or more, 92.10.

Stannous Sulphate: Less than 50 lb, 131.60; 50 lb, 101.60; 100-1900 lb, 99.60; 2000 lb or more, 97.60.

Zinc Cyanide: Under 1000 lb, 55.55; 1000 lb and over, 53.55.

you'll save on blast cleaning costs

Malleabrasive reduces overall cleaning costs as much as 50% because—

- It wears 2 to 4 times longer than ordinary shot and grit.
- It increases output of cleaned castings.
- It reduces wear on machine parts and cuts machine down time.

These are not just claims. You can prove these savings right in your own plant, in your own machines. We supply all the necessary forms and instructions.

Malleabrasive has reduced costs in more than 800 plants. Why not yours?

make your own 30 day test...

These forms will show you how. Write for samples and information

In easy to handle 50-pound Double Burlap Bags.

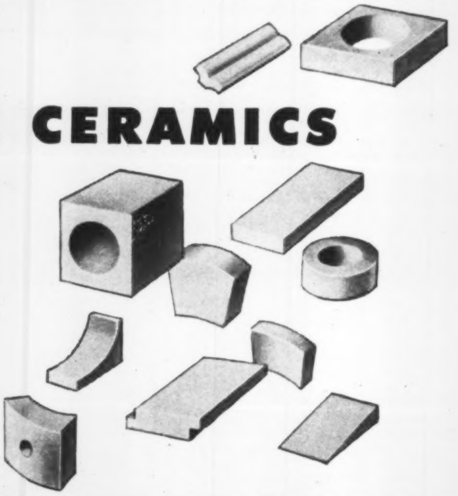
MALLEABRASIVE

THE GLOBE STEEL ABRASIVE CO., MANSFIELD, OHIO ®

Sold by Pangborn Corporation, Hagerstown, Md., and by leading distributors of foundry supplies from coast to coast.

Immediate action for

MADE TO ORDER CERAMICS



One of our Illinois plants can presently take on another large or several small orders for refractories, face brick or building tile for manufacture to your specific requirements. 100 years' experience at your service. Skilled ceramic craftsmen backed up by a 200 tons per day stiff mud operation. *Write. Wire. Phone. Dept.STE, Laclede-Christy Division, H. K. Porter Company, Inc., 2000 Hampton Ave., St. Louis, Mo., Mission 7-2400.*

FOR SALE OR RENT

1—American Terry Model 1-75 Steel Erectors Guy Derrick, 85' mast, 75' boom. Rated 15-ton @ 30' radius.

1—100 KW Ideal AC Generator, 127/220/230/400/440 volt, 3 ph. 50 or 60 cycle, with Hercules DNX diesel engine, skid mounted. Weight 16,170#.

LOCOMOTIVES

3—Plymouth Standard Gauge: 1—8-ton Model D.L.B. serial #4203 with 4-cyl. Buda gas. engine. 2—10-ton Model ULDS, serial #5462 and #5396 with 6-cyl. Caterpillar mdl 318 diesel eng.

3—Brookville Standard Gauge, 8-ton, model B.F.A., serial #2749, #2753 and #2864 with factory rebuilt 100 HP Ford V-8 eng.

Write for New Stock List No. 456

EQUIPMENT CORPORATION OF AMERICA

CLIFTON HEIGHTS, PA., Box 608A, Sub. of Philadelphia
GROVETON, PA., Box 43A, Sub. of Pittsburgh
CHICAGO 4, ILL., 327A S. La Salle St.
NEW YORK 7, N. Y., 30A Church St.

Steel Grating for Sale

Large lot of used Irving subway grating
Bridge Type
2½" x 3/16" bars

BUILDERS IRON WORKS
Somerville, Mass.
MOnument 6-2000

FOR SALE

STEEL NAIL BURRS, Cleaned, dry and free of sawdust, steady accumulation approx. 10 tons monthly. Samples sent on request.

PHILADELPHIA NAIL & WIRE CO., INC.
S.E. Cor. 61st & Vine Sts.
Philadelphia 39, Pa.

FOR SALE

1—Used Angier Bench Machine, covering coil size 4" I.D. to 22" I.D. with coil traverse cross section from ½ to 4", ¼ H.P., 440 Volt, 3 Phase, 60 Cycle.

ATHENIA STEEL DIVISION
National-Standard Co.
Clifton, New Jersey

WE CAN HELP YOU TO CONTACT high calibre men to fill specific jobs you have in mind—

Readers of STEEL include men of wide training and experience in the various branches of the metalworking industry.

When you have an opportunity to offer, use the Help Wanted columns of STEEL.

CASH

FOR USED TRANSFORMERS

Convert your used transformers to cash! Send us a description of them TODAY.

TRANSFORMERS AND COILS BUILT TO YOUR SPECIFICATIONS.

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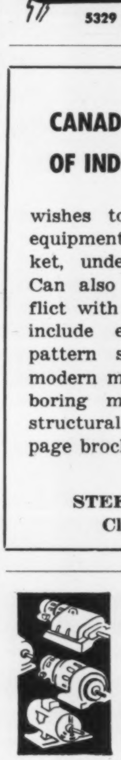

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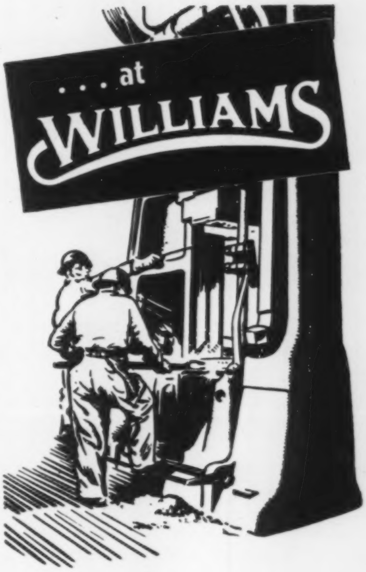

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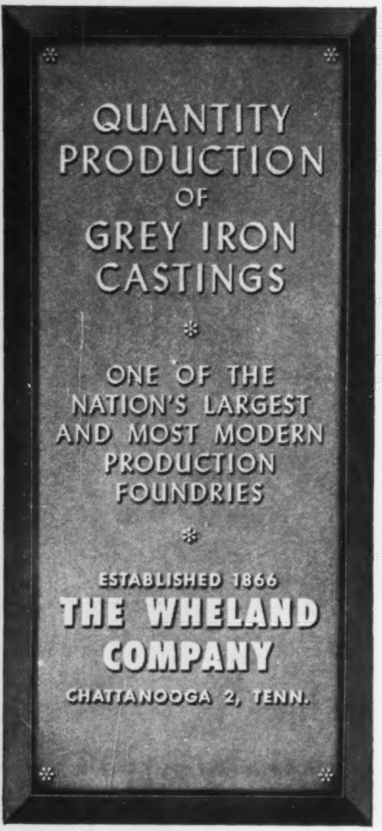

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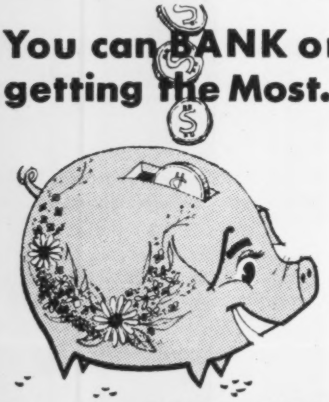

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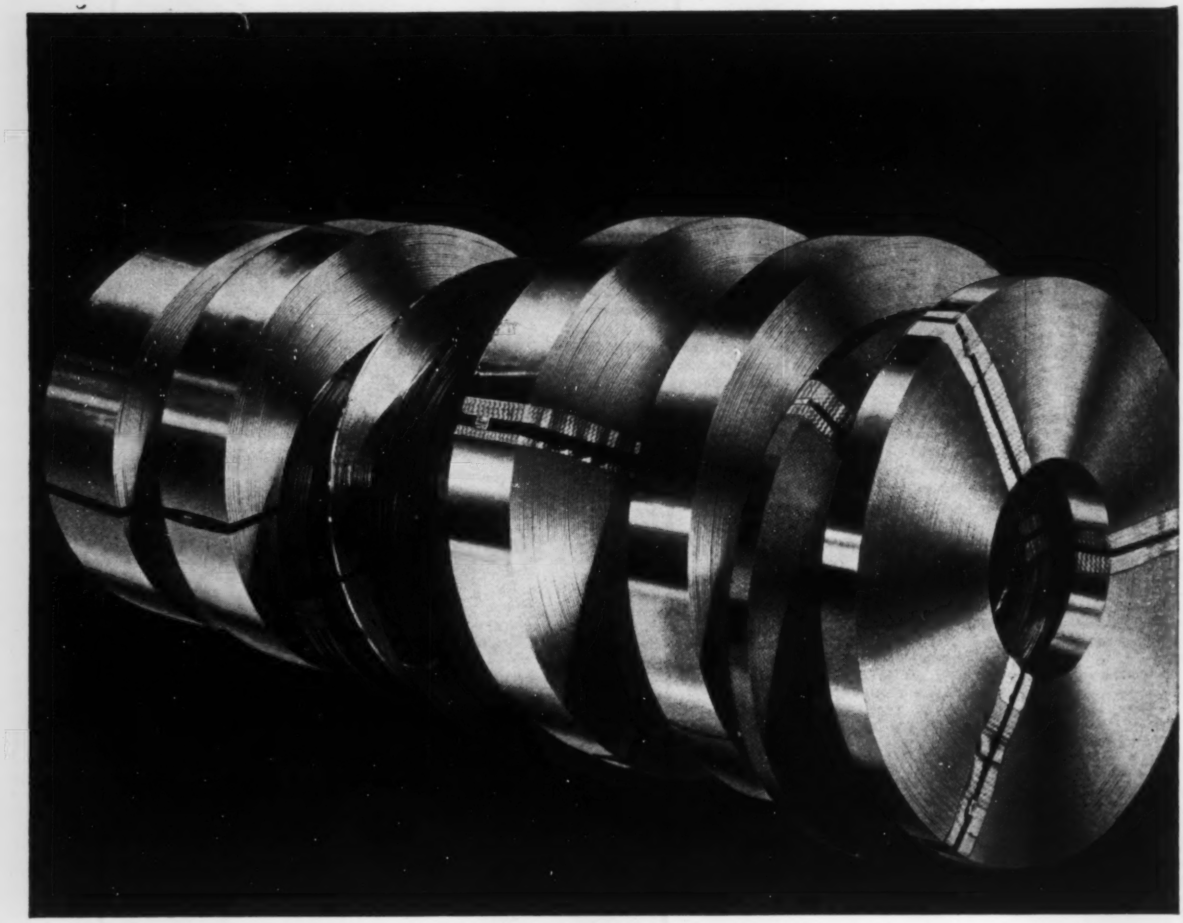

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No. 182

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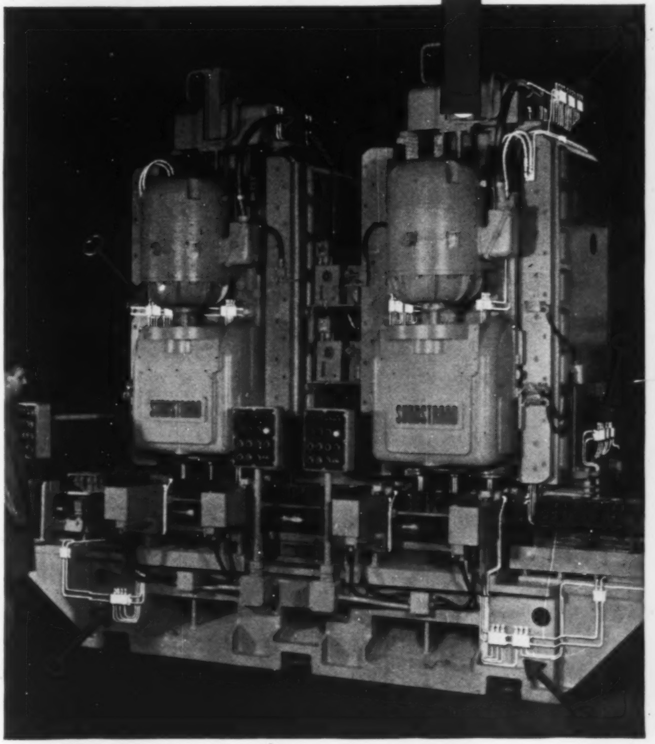

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